

# ELECTRICAL REVIEW

FRIDAY  
OCTOBER 1961

WEEKLY  
PRICE 1s 6d

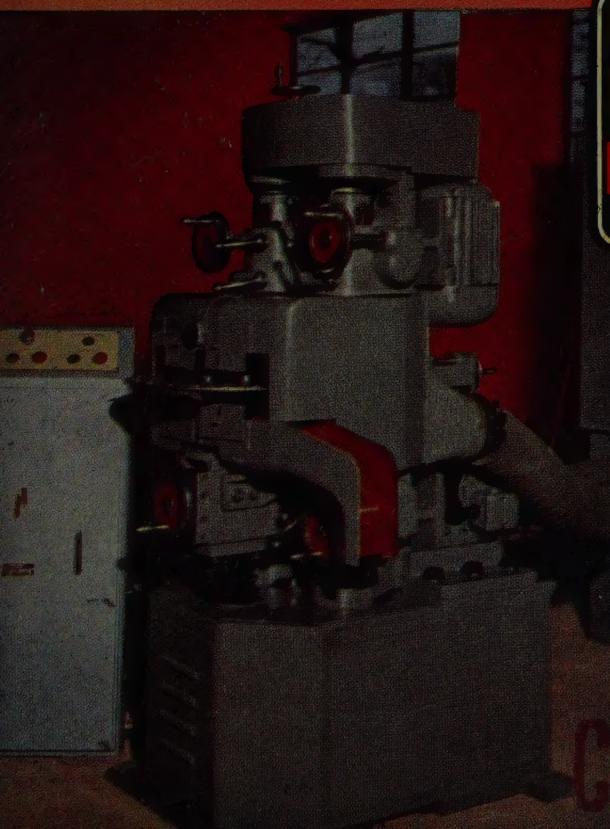


D' Type Totally Enclosed Fan Cooled Motors and 'C' Type Ventilated Motors — now interchangeable for same size and dimensions.



## FINE TEXTILES TO FINE MACHINE TOOLS

Brook products bring reliable power and efficient control to every industrial application. Current motor designs are lower in cost resulting from new developments in production and the use of better materials. Control gear can be supplied in a wide variety of standard types or large panels can be specially built to individual needs.



**BROOK**  
ELECTRIC  
MOTORS

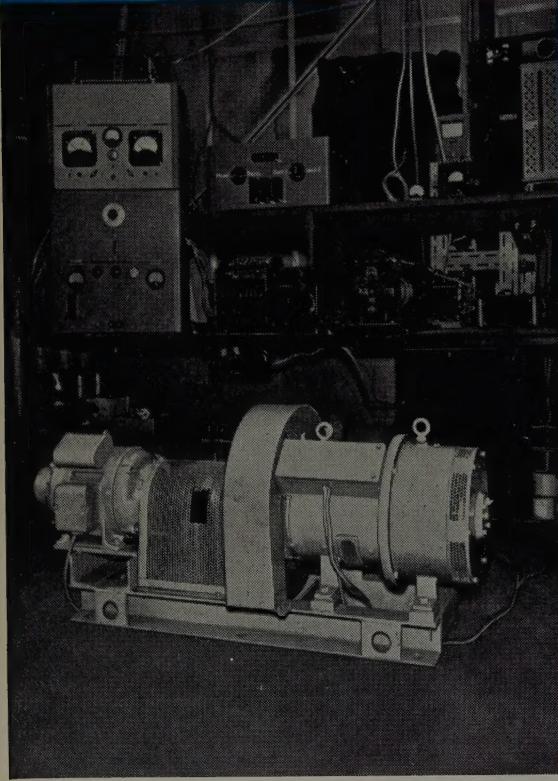
**1  
25 th. to 600  
Horse Power**



Brook Standard Starters for Direct Switching — Star Delta — Stator/Rotor — Reversing — Multi-Speed; plus a comprehensive range of limit switches — push button stations etc.

**CIRCULATION COPY** **BROOK MOTORS LTD**  
Huddersfield

# E.D.C.C. &



Special motor-alternator set  
providing a three-frequency  
output.

**E.D.C.C. are manufacturers of :**

Dynamometers	HF alternators
Rotary convertors	Voltage stabilisers
Flame-proof marine motors	Rotary transformers
Frequency changers	Battery traction motors
Induction regulators	D.C. generators
Single and polyphase alternators	Magnetic couplings, Control gear, etc.



## SAFETY AT SEA

The custom-built Triple Frequency Generator supplied for the Trinity House Experimental Station at Dungeness is yet another example of Electro-Dynamic special purpose equipment. This generator is used for energising experimental fog-signalling equipment. It comprises three alternators in a common casing, having 16, 22 and 28 poles respectively and is driven by a 2-pole induction motor, through a magnetic-particle type coupling and flywheel.

**ELECTRO-DYNAMIC**

**CONSTRUCTION COMPANY LIMITED**

ST. MARY CRAY ORPINGTON KENT TELEPHONE: ORPINGTON 27551 TELEGRAMS: ELEDAMIC ST. MARY CRAY  
Control Gear Division: Bridgwater Somerset Telephone: Bridgwater 2882 Glasgow Office: 40 Houldsworth St C3 Telephone: Central 2620

# RELAYS



PO 600  
TYPE RELAY  
(Minor)



PO 3000  
TYPE RELAY  
(300 ma and  
10 amp  
Contacts)



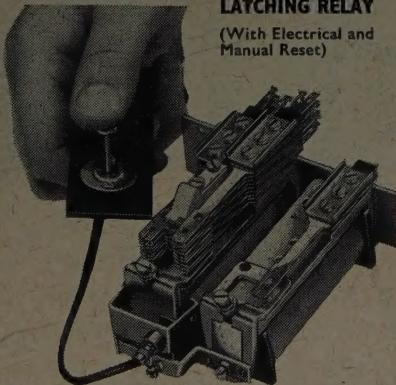
PLUG IN 3000 TYPE  
RELAY

(Moulded Cover and base)  
With transistorised amplifier  
Clip retains Relay positively  
in any position

## KEYSWITCH RELAYS

### LATCHING RELAY

(With Electrical and  
Manual Reset)



SILENT  
A.C. RELAY  
CONTACTOR  
(Switching  
30 amps)

(240 volts V.A.C.)



PLUG IN  
3000 TYPE  
RELAY

(Metal Cover)  
Clip retains Relay  
positively in any  
position



Manufactured as required for customers' own applications in :  
AUTOMATION • COMPUTERS • TELEPHONE and INTERCOM  
SYSTEMS • BATCH COUNTING and PHOTO-ELECTRICS • MOTOR  
and MACHINERY CONTROL • AUTO-TIMING and AUTOMATIC  
SIGNALS • CURRENT and VOLTAGE REGULATION, etc.

Calculator providing full Relay Specifications is available FREE on request

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PRAED STREET, LONDON, W.2

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Extremely advantageous quotations and  
delivery can be offered for quantity orders.



## Test for dependability

Exhaustive works testing at every stage of manufacture ensures the safe and efficient dependability of SANDERS Switchgear, renowned for superb performance and lasting reliability. Excellence of design, high quality finish and the embodiment in every Sanders product of years of specialised experience are not enough. Every SANDERS Unit must pass the most stringent works tests with a comfortable margin. This way you can be sure — as we are — that SANDERS Switchgear will survive the most rigid of all tests for dependability, that of continuous loading in daily use. Space-saving compactness, simplicity, ease of wiring and installation and complete dependability are your guarantee that

SANDERS SWITCHGEAR IS RIGHT IN EVERY ASPECT

**SANDERS**



## INFLATED BILLS

The Pelican's peculiar ability, as immortalized in the nursery jingle, remains unchallenged. No industrial consumer of electrical power can accept with equanimity, however, bills inflated by surcharges for maximum kVA demand.

The low P.F. associated with most industrial loading—induction motors, welders, furnaces, etc.—can be corrected so simply and economically with the latest ranges of Power Capacitors by STC. Employing unit construction, these robustly built, oil-impregnated capacitors are simple to install, occupy a minimum of floor space and are easily adaptable to changing plant requirements.

If you are finding kVA surcharges difficult to swallow, why not consult STC who have immediately available the capacity to reduce your bills.

*Write for Power Factor Correction Literature to:*

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POWER CAPACITORS  
FOR POWER FACTOR  
CORRECTION



61/2MC

**Standard Telephones and Cables Limited**  
CAPACITOR DIVISION: BRIXHAM ROAD • PAIGNTON • DEVON

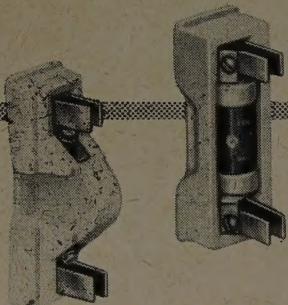
# The "MEMREX-EXEL" Range of Switchgear

COMPLIES WITH B.S. 2510-1954

**RATINGS:****SWITCHES 10, 15, 30 AMPS****SWITCHFUSES:****10-15-30-60 AMPS****500 VOLTS**

Fuses are of the new "Kantark-Exel" pattern, the bases of which will accept semi-enclosed rewirable or H.R.C. fuse carriers.

Semi-enclosed rewirable (damper-type) pattern comply with B.S.3036:1958.



H.R.C. cartridge pattern are interchangeable with semi-enclosed rewirable pattern and comply with B.S.88:1952.

M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links made to B.S.88:1952, Appendix 'J' Dimensions, Form A-Offset Tags.

Ample wiring space and a detachable switchbar greatly facilitate the speed of wiring.

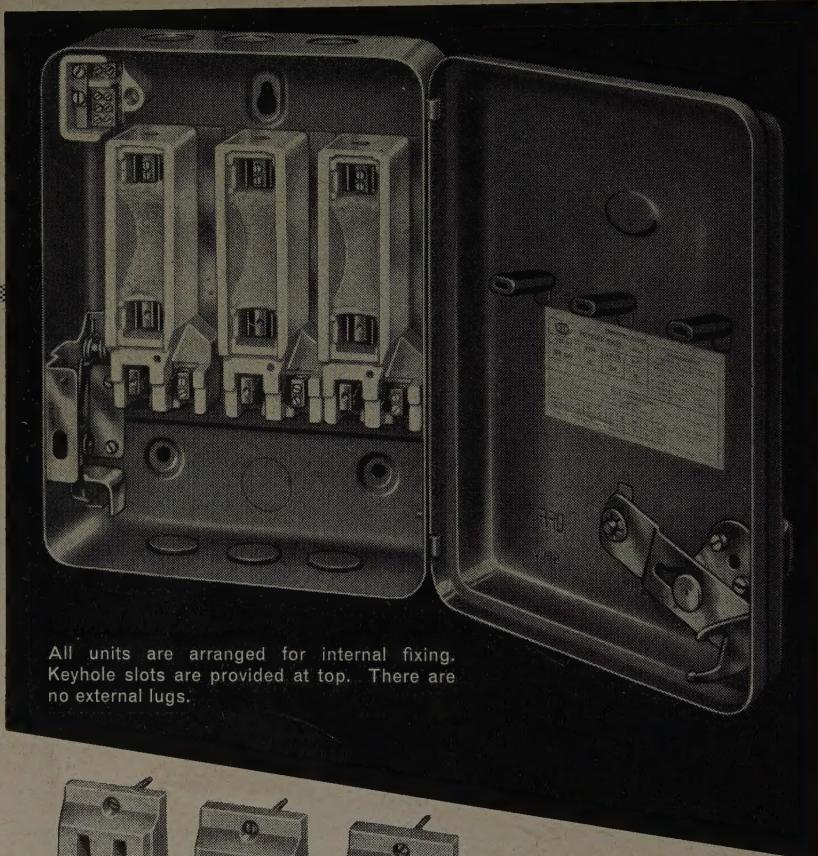
All live metal is adequately shielded to avoid accidental contact when cover is open. The porcelain shields also serve as efficient arc barriers.

The range ensures compliance with the most strict interpretation of I.E.E. Regulations (13th Edition) and with the requirements of The Electricity (Factories Act) Special Regulations.

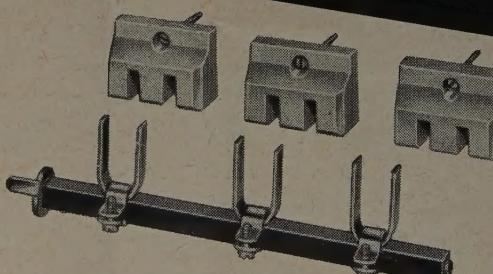
This new range of "Memrex-Exel" switchgear provides one of the most up-to-date and technically advanced ranges of 500 volt industrial switchgear yet offered to the industry. Modern styling, sound technical performance and compliance with all relevant British Standards Specifications are basic essentials.

The cases are of one piece pressed steel with hinged covers, rustproofed and finished grey stove enamel.

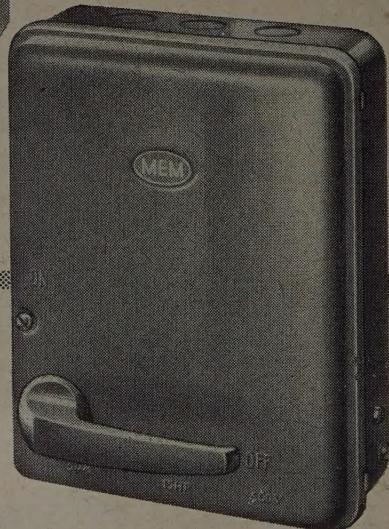
Three semi-pierced knockouts are provided at top and bottom and one knockout at left hand side of case for coupling switchgear to adjacent motor starters, etc.



All units are arranged for internal fixing. Keyhole slots are provided at top. There are no external lugs.



Front operating switch handles are fitted on all units to improve appearance and allow for more compact assemblies on switchboards and panels.



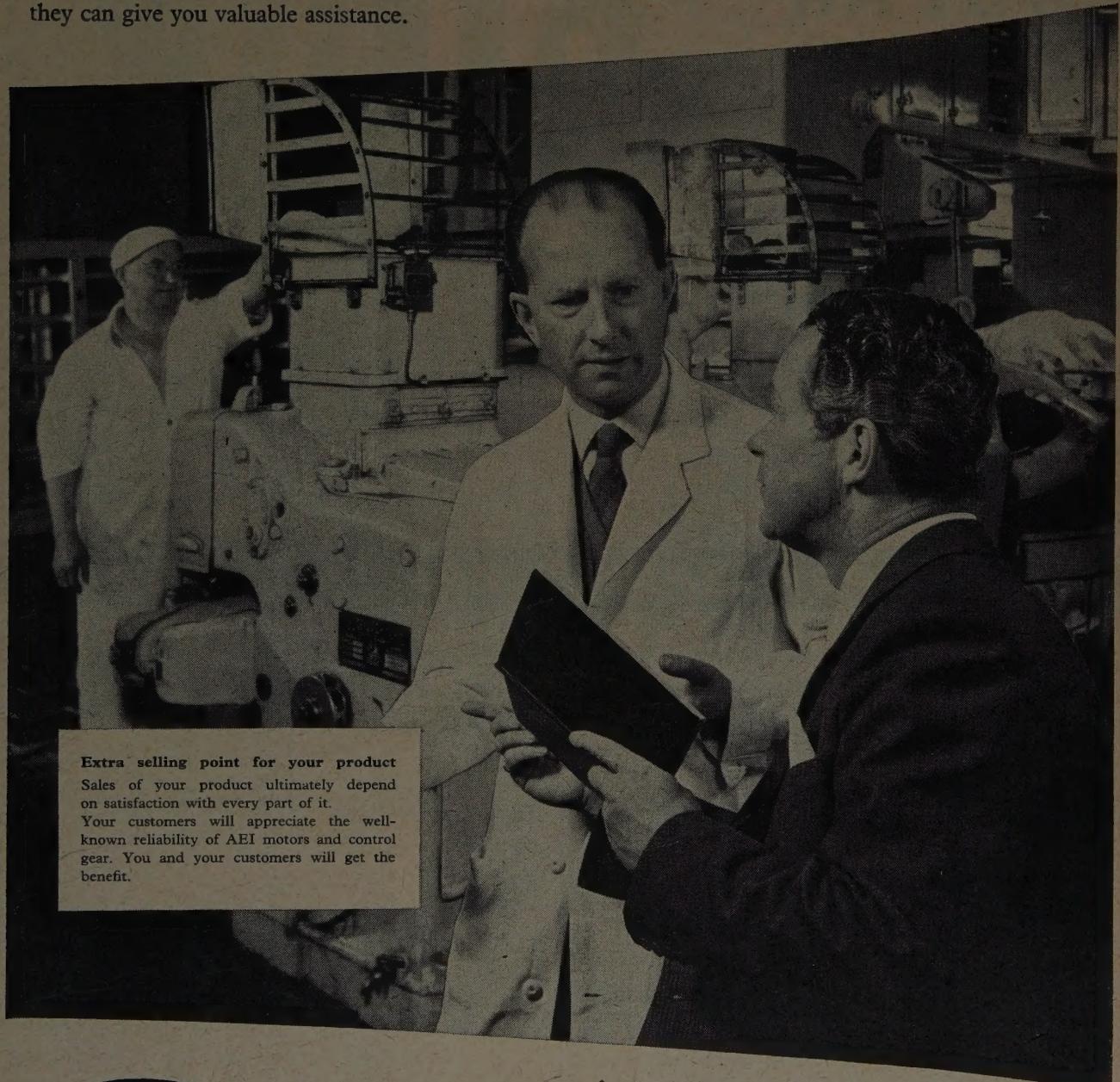
**THE GREATEST SAFEGUARD  
AN INSTALLATION CAN HAVE**

Write for catalogue No. 450R

**MEM**

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Sales of your product ultimately depend on satisfaction with every part of it. Your customers will appreciate the well-known reliability of AEI motors and control gear. You and your customers will get the benefit.

**AEI**

**Associated Electrical Industries Limited  
Motor and Control Gear Division**

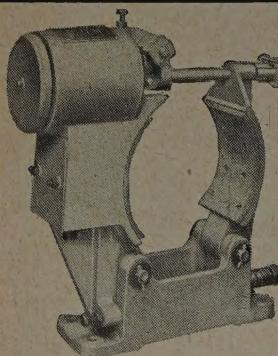
RUGBY & MANCHESTER, ENGLAND

# DUPAR ELECTRO MAGNETIC BRAKES

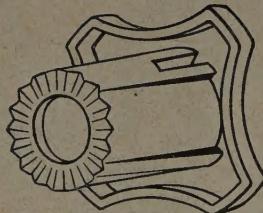
Widest range of electromagnetic brakes manufactured — you can select exactly the right brake for the job.



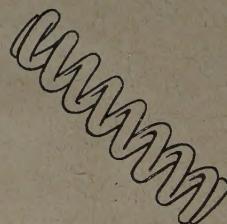
## WHY DUPAR BRAKES ARE THE BEST ...



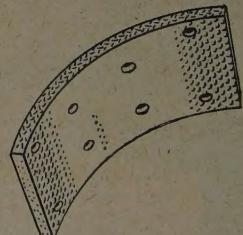
A.C. or D.C.  
Sizes 2" to 30"  
Retarding torques  
2 to 3,600 lb ft.



Hand wheel  
adjustment means  
easy setting and  
take-up of lining wear.



Patent spring  
setting ensures  
complete accuracy  
in operation.



Generous lining area  
means reduced  
working pressure.  
Longer life—less wear—  
lower stresses.

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Field Offices at: Birmingham • Glasgow

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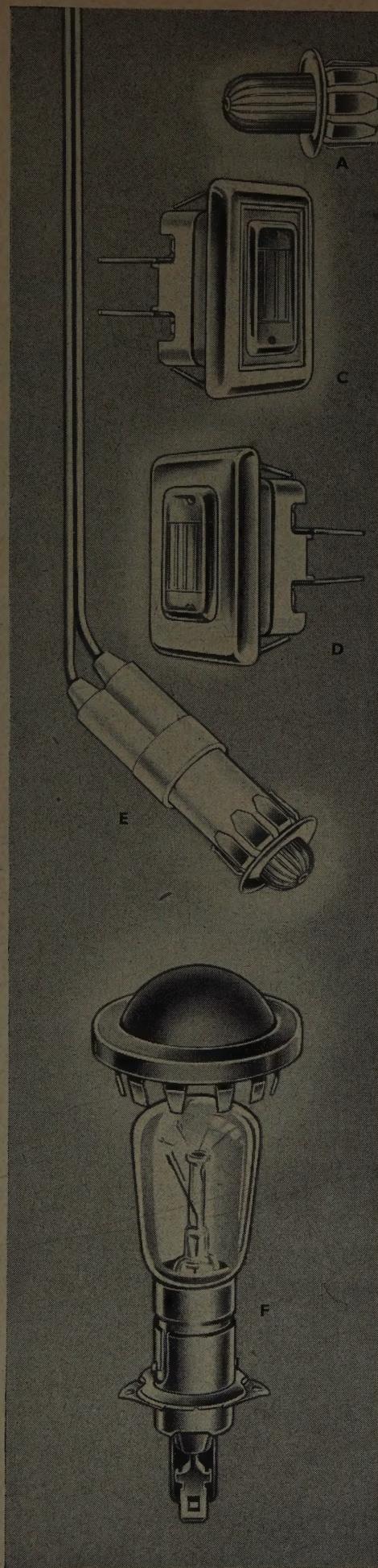
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Telegrams: Dewhurst, Hounslow

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# NEW SNAP-IN Neon Indicator Lights AND ON-OFF SWITCHES

For indicator lights and switches that are easy to install and rattle-free (even under severe vibration), call in CARR.

Carr's Electrical Division produces a wide range of neon indicator lights and on-off switches, specially designed for speedy 'snap-in' assembly. Once installed, spring tension holds them firmly and securely.

Special modifications to standard units can be made where large quantities are required; our engineers will be glad to assist and advise.

- A Snap-in mains indicator light for panel thickness .032"—.093".
- B Snap-in mains on-off switch.
- C Mains indicator light with Chrome Plated, half bezel.
- D Mains indicator light with Chrome Plated, full bezel.
- E Mains indicator light with plug and socket—splashproof design.
- F Pigmy Signal light with domed lens and snap-in bezel.

**CARR FASTENER COMPANY LIMITED**  
Stapleford, Nottingham Phone : Sandiacre 2661 Telex 37637

London: 195-197 Gt. Portland Street, London, W.1. Museum 9361.

Manchester: Sunlight House, Quay Street, Manchester, 3. Blackfriars 2533.

Birmingham: Silhill House, 2235 Coventry Road, Sheldon, Birmingham, 26. Sheldon 5208-9.

Glasgow: Baltic Chambers, Wellington Street, Glasgow, C.2. City 3202.

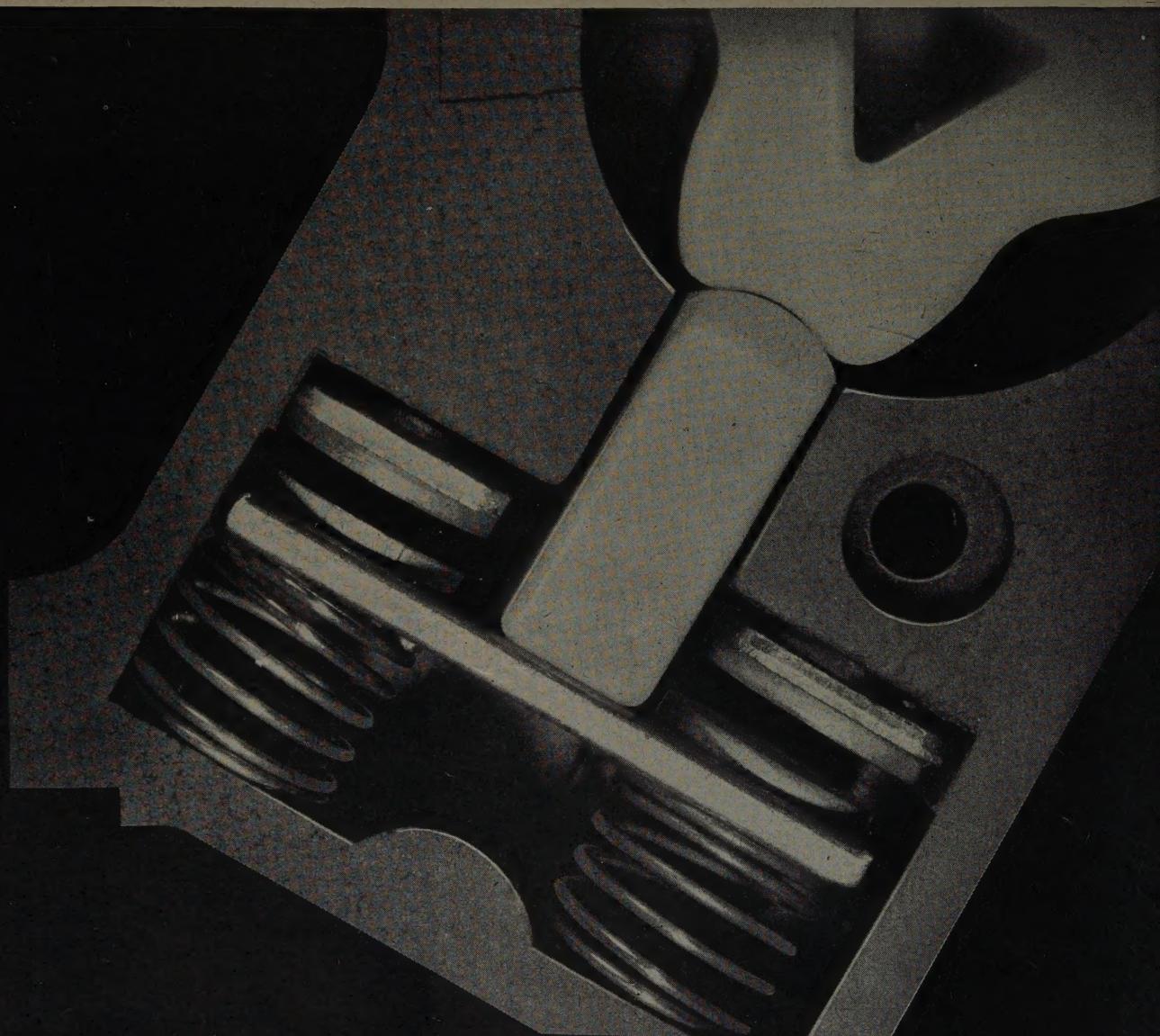
# 'HIDUTAC' switchfuses break 8 times their rated full load current

This high breaking capacity is made possible by cam-operated, silver contact, double-break "interruptor" units—just one of many 'Hidutac' exclusive features resulting from the *new approach* of the G.E.C. Installation Equipment Group to switchgear design. The *new approach* has crystallised from G.E.C.'s many years' experience of making switchgear superbly well.

Consider these other impressive advantages: *Unlimited full load switching*—'Hidutac' switchfuses operate at their full load current with unfailing reliability. *A unique compactness*, brought about by radial positioning of contacts. Generous wiring space and easy access to terminals at the front. *Total internal enclosure* of all moving parts, with shields over live terminals. *High fault current protection* in Single Pole and Neutral, Double Pole, Triple Pole and Neutral switchfuses with H.R.C. or rewirable fuses. Categories of duty are: H.R.C. fuses, all ratings, AC4 of BS88 (33000 amp); rewirable fuses, 15 and 30 amp ratings, S2A of BS3036 (2000 amp); rewirable fuses, 60 amp rating, S4A of BS3036 (4000 amp). *Modern styling* of pressed steel case with fully interlocked cover.

These exclusive features make 'Hidutac' switchfuses vastly superior for tungsten and discharge lighting control, motor control, and transformer and capacitor switching.

**IMMEDIATE DELIVERY** of 'Hidutac' switchfuses from wholesalers throughout the country. For more detailed information ask your wholesaler for 'Hidutac' literature.



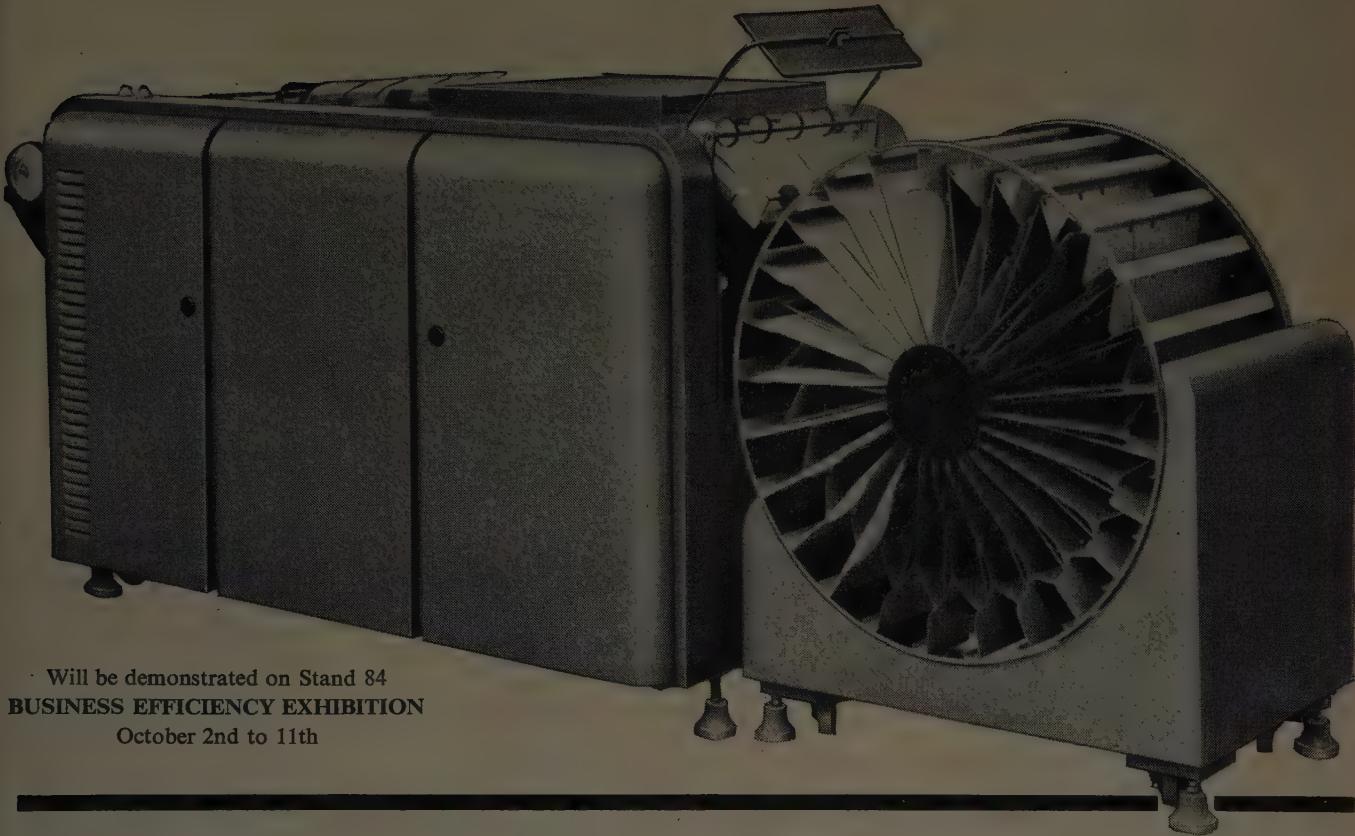
that's the New Approach of

**G.E.C.**

INSTALLATION EQUIPMENT GROUP

**One operator . . . one machine . . .**

**3000 dyeline prints an hour!**



Here is the fastest automatic dyeline photoprinting machine in Britain: the ILFORD Azoflex Model 155. Using Azoflex Ninety Ninety paper, and one operator, the Azoflex Model 155 can produce every hour 1500 copies (size 13" x 16") or 3000 copies (size 8" x 13" or 8" x 10") of the following:

- ★ Computer outputs
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- ★ Accounts sheets
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A 25-compartment Print Collator has been designed for operation with the ILFORD Azoflex 155. Both are available for outright purchase or on hire. The Azoflex system does not use ammonia and is glare-free. Azoflex dyeline papers and machines are the finest and fastest in Britain today.

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*Write for full details of the ILFORD Azoflex  
range of dyeline printing papers and machines from*

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# HAWKE

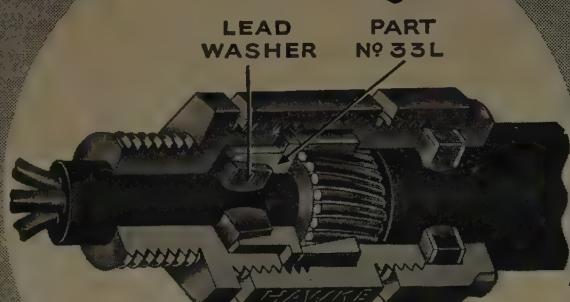
*introduce . . .*

## *a New Gland*

for

**FLAMEPROOF & STANDARD  
INSTALLATIONS**

An alternative method of gripping inner sheath on lead, P.V.C. and all other types of sheathed cables



The parts shown replace normal parts Nos. 22 and 33 for lead sheathed cables

This alternative method can be applied on the following glands: G62, G63, G64, G65, G67 and G68.

If it is required, customers should refer when ordering, to the normal gland size required and state the type of cable to be used.



The diagram shows the ease with which a lead sheathed cable can, if required, be withdrawn from the box or other fitting without disrupting the cable or packing

**NOTE—  
CABLE OR WASHERS NOT DAMAGED  
IN ANY WAY**

# HAWKE

**CABLE GLANDS LTD.**  
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## These cables will be as good as new in A.D. 2011

These gangers and jointers are laying cables made with aluminium conductors. It's a sight that is becoming increasingly familiar in British cities, from London to Glasgow. It means power PLUS for homes, factories, offices and mines. The PLUS is Alcan aluminium in those conductors. They will still be carrying their load 50 years from now.

The gangers are installing 4 core 3 sq. in. low-voltage distribution cables. Aluminium is also increasingly used in high-voltage and extra-high-voltage feeders. It has great advantages for the sheathing of pressure-type cables. Jointing presents no problems.

Today, aluminium is the cheapest conductor material. Alcan production capacity and Alcan research make sure that it will hold its lead.

Cable manufacturers can give you further advice on aluminium cables. Write to them, or write to us:  
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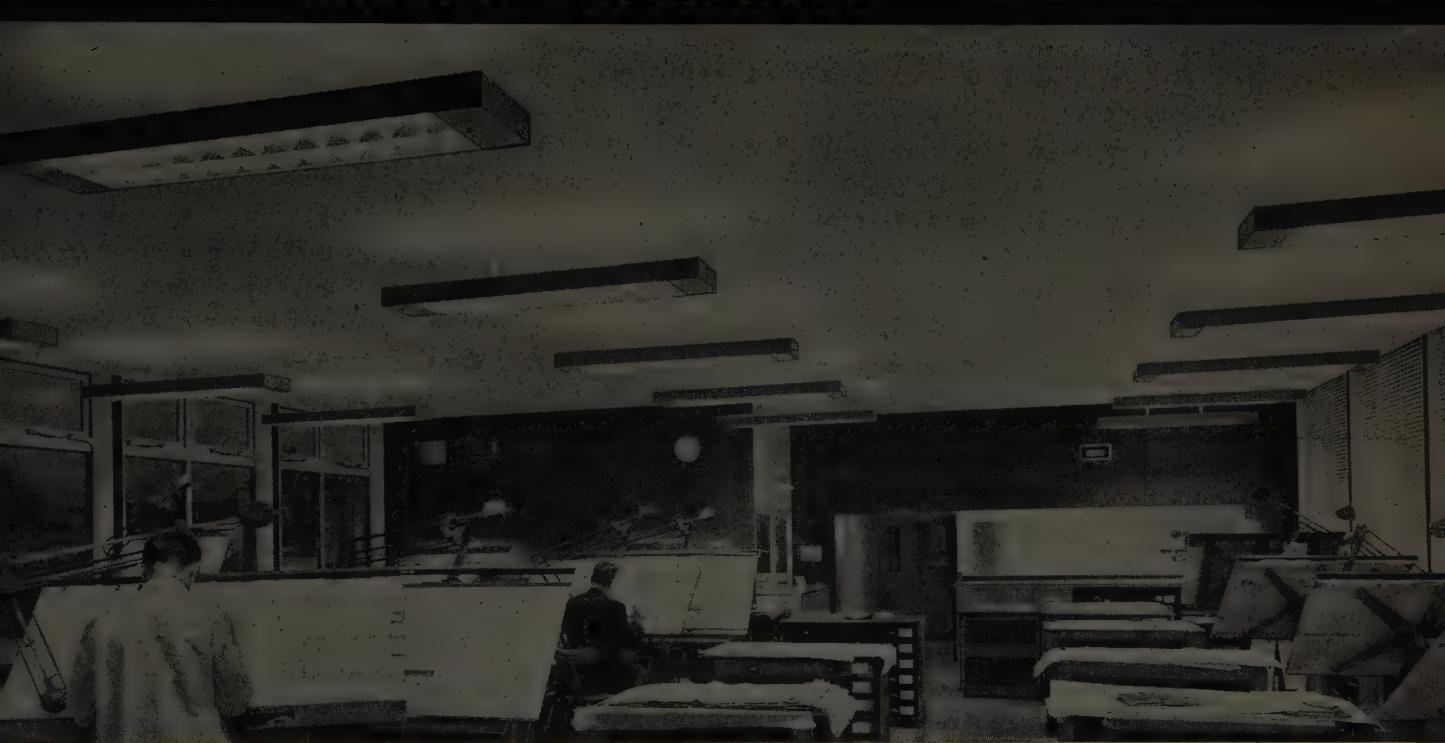
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you have never seen  
**OFFICE LIGHTING**  
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Pleasant working environments with accompanying efficiency call for reasonably high levels of illumination—but such high level illumination must be free from discomfort glare.

Merely to increase the light source brightness results in excessive glare from the lighting fitting. The answer is low brightness fittings of high luminous output—"Comfort in Lighting" fittings developed by G.E.C.

**The G.E.C. range of "Comfort in Lighting" fittings is the only one which meets the recommendations for every type of installation of the new Code for Good Interior Lighting issued by The Illuminating Engineering Society.**

You could see lighting like this every day in *your* office, by installing G.E.C. "Comfort in Lighting". Write for the 40 page illustrated brochure F4695 or better still, ask us to send a Lighting Engineer. Our Lighting Advisory Service is entirely free and without obligation.

## comfort in lighting

*means high level illumination without discomfort glare.*

**G.E.C.**

LIGHTING & HEATING GROUP



## VERSATILITY!

Not surprise—just modest pride! We must confess to a similar feeling every time yet another example of the amazing versatility of TUFNOL is confirmed.

Bearings for ships propeller shafts, and rudders, runners for Arctic sledges, seat rollers for the Oxford University Boat, insulators for high voltage switchgear, slideways for machine tools, control pulleys for aircraft, bearing bushes for motor cars, gears for textile looms—these are but a few of the many varied ways in which TUFNOL is being used to overcome problems of design, production or maintenance.

TUFNOL is a laminated plastics material of such versatility that no engineer can afford to ignore it.

STRONG BUT LIGHT  
RESISTS CORROSION  
WITHSTANDS CLIMATIC EXTREMES  
ELECTRICAL INSULATOR  
MACHINES EASILY  
STORES INDEFINITELY

VERSATILE **TUFNOL**  
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# THE COLLEGE OF SCIENCE AND TECHNOLOGY, MANCHESTER

Engineering Services for the Switchboard illustrated below were designed by Bradshaw, Gass & Hope of Bolton. The Switchboards supplied for the more recent extensions were to the instructions of Roger Preston & Partners.

have installed  
**"ERSKINE HEAP"**  
**SWITCHGEAR**  
**& MOTOR CONTROL GEAR**



The illustration above shows the main switchboard for controlling the power and lighting to both the original College and the New Extensions. The switches are of 25 MVA rupturing capacity, tested to BS.116 at 400 volts. Duplicate bus bars are provided with front-of-board operated changeover switches for changing over between the College's own Turbo Alternator Set and the Electricity Board.

Bottom left hand illustration is one of the many circuit breakers for controlling the lift installations. The centre illustration below shows a few of the twelve distribution boards throughout the building. The bottom right hand illustration shows one of the solenoid operated 25 MVA ironclad circuit breaker units.

## ERSKINE, HEAP & CO LTD

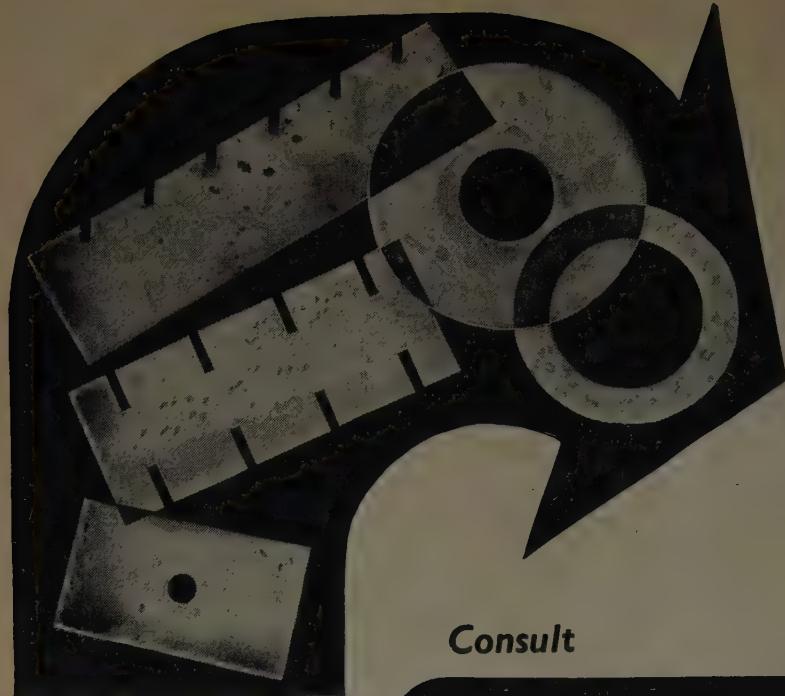
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Brand



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TUBULAR  
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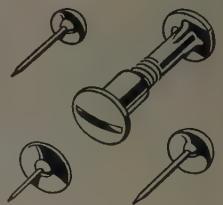
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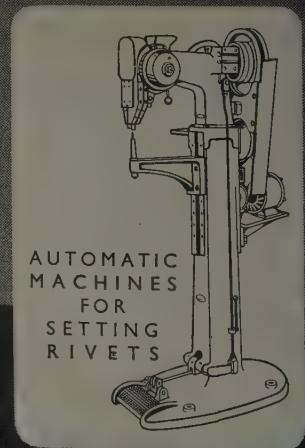
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FOR  
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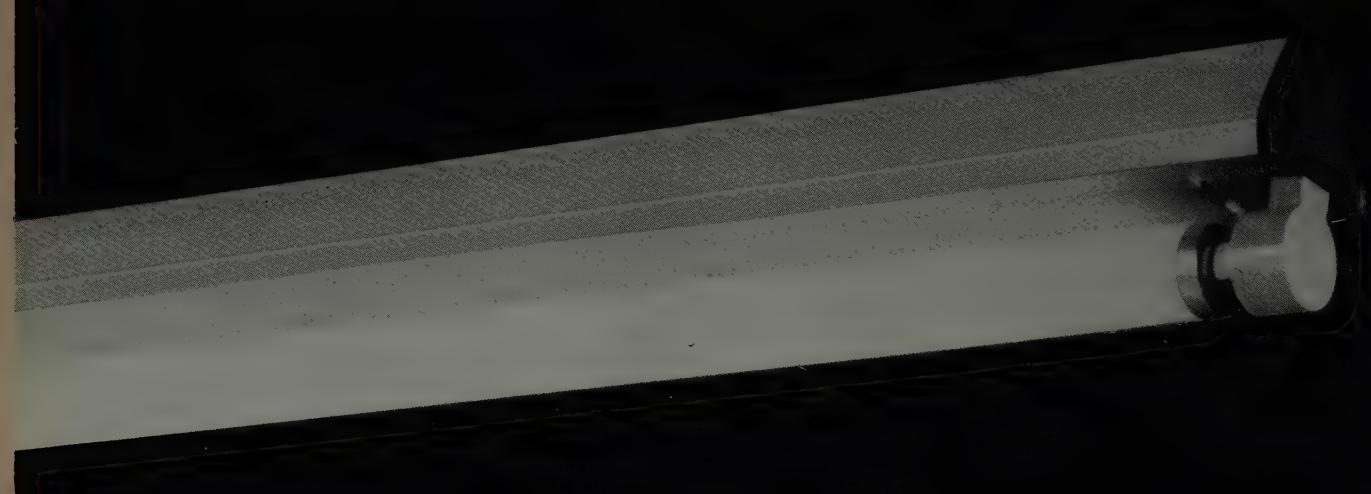
**FINEST VALUE FOR**

**EVERYTHING**

**ONE OR TWO LIGHT FITTINGS**

**INSTANT START FOR**

AT JIM



**MONEY**

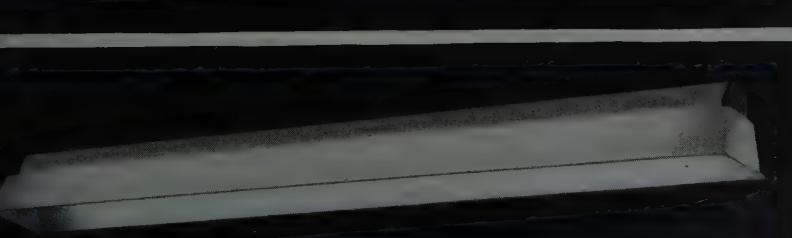
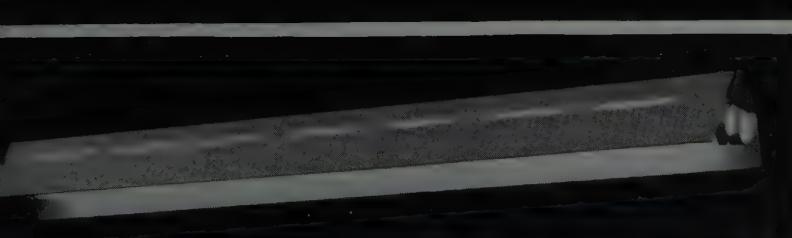
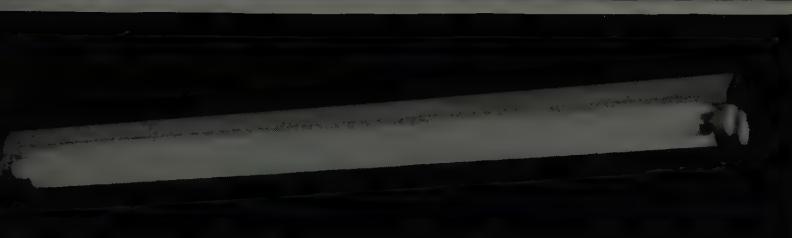
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**FOR 2FT. 5FT. AND 8FT. SIZES**

**FOR 4' AND 5' SIZES**

**SEE THE NEW SLIM JIM  
FLUORESCENT FITTINGS  
AT YOUR  
NEAREST G.E.C. SHOWROOM**

PRICES APPLY ONLY IN GREAT BRITAIN AND NORTHERN IRELAND

**2FT 4FT 5FT 8FT**

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F.36707 Channel 2 light	F.36714 2-20w Switch Start <b>£5.3.8</b> Inc. 3/6 P.Tax & Surcharge	F.36707 2-80w Instant Start <b>£9.4.0</b> Inc. 4/- P.Tax & Surcharge	F.36702 2-125w Switch Start <b>£12.10.0</b> Inc. 4/- P.Tax & Surcharge	
Attachments	F.41184 20w <b>£1.7.7</b> Inc. 4/7 P.Tax & Surcharge	F.41195 40w <b>£1.19.7</b> Inc. 6/7 P.Tax & Surcharge	F.41191 80w <b>£2.2.0</b> Inc. 7/- P.Tax & Surcharge	F.41186 125w <b>£3.9.8</b> Inc. 11/8 P.Tax & Surcharge
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F.62381 Stove Enamel Open-ended Reflectors			F.62381 80w <b>£1.3.0</b>	F.62370 125w <b>£2.5.0</b> Inc. 17/2 P.Tax & Surcharge
F.62383 Stove Enamel Open-ended Reflectors			F.62383 2-80w <b>£1.3.0</b>	F.62372 2-125w <b>£2.5.0</b>
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LIGHTING  
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GROUP



SLIM JIM  
packs the finest value in fluorescent lighting

# SLIM JIM



'Slim Jim' comes complete in one pack.

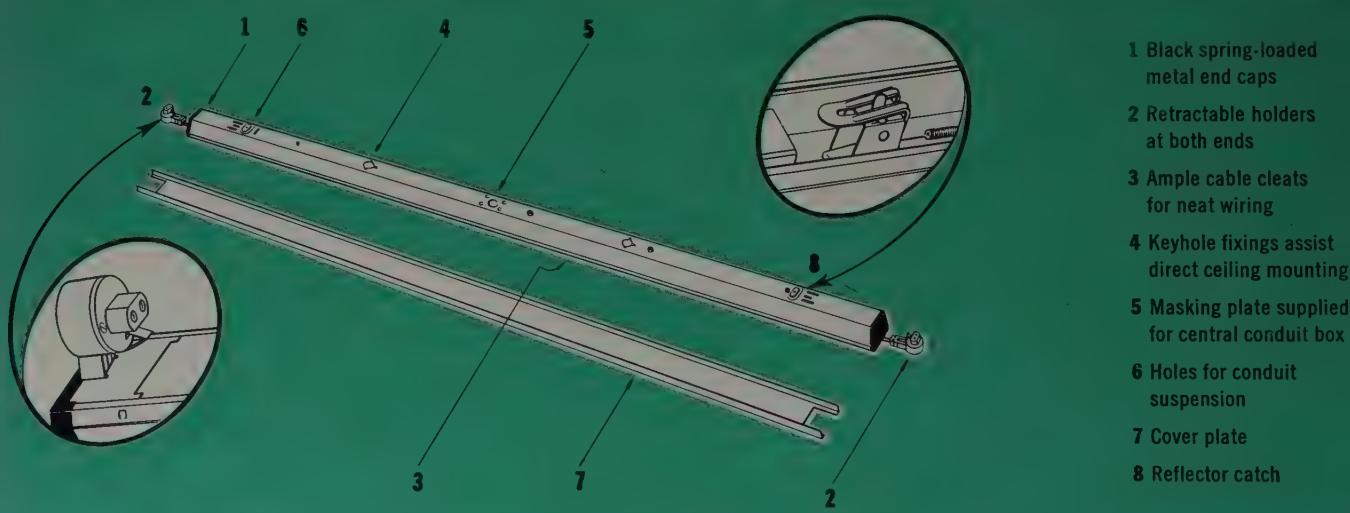
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Ingenious catch snap fits reflectors by simply pushing up into spine. Good looking, well designed attachments and diffusers.

*Patents applied for*



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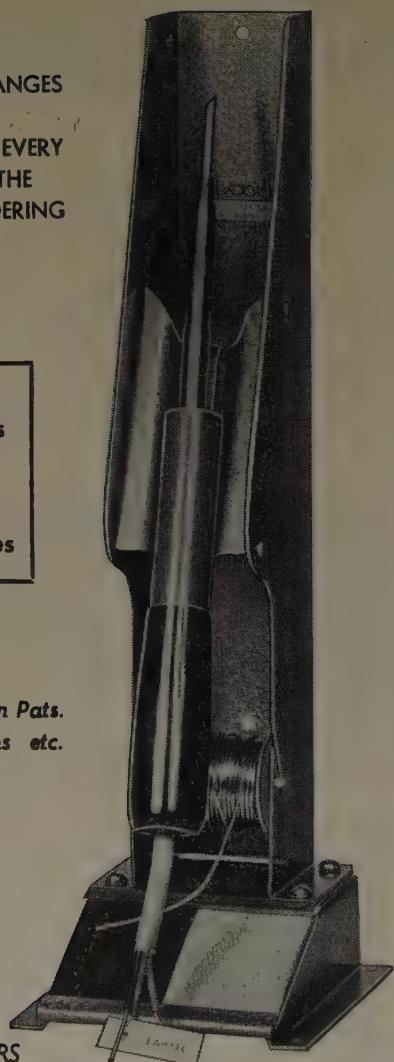
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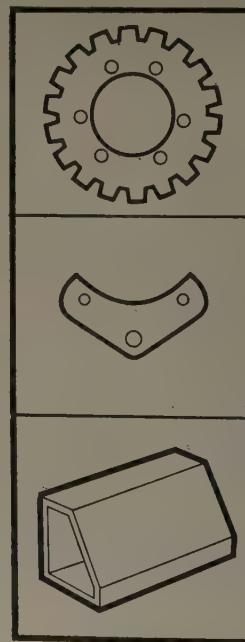
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5 amp. 250 v. A.C. Brown or White**

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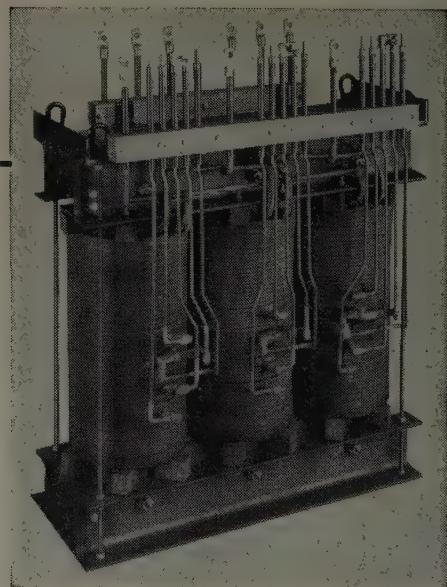
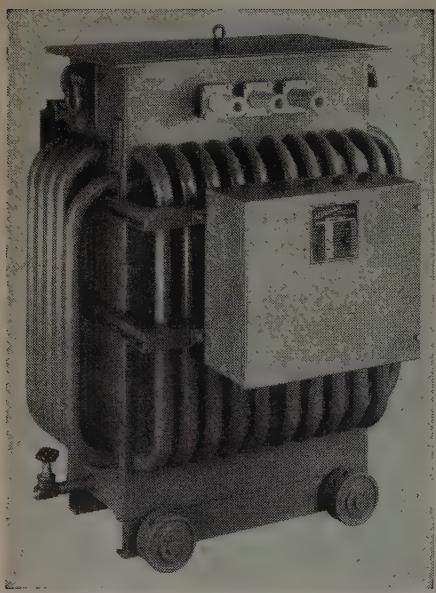
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60W. 2/0½d. 100W. 2/0½d. 150W. 2/8. (all inc. P. Tax)

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	A123	B45	C67	D8910
for earthing cables up to	7/0.036"	7/0.064"	19/0.064"	19/0.083"
to fit B.S. conduit sizes i.e. in trade terms	1, 2 & 3 1" to 2"	4 & 5 1" and 1½"	6 & 7 1½" and 2"	8, 9 & 10 2½" to 3½"

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MALE  
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**FEMALE**  
Flat Face Section for  
Spanner (except 8"  
size which is round)

### CONDUIT HOOK

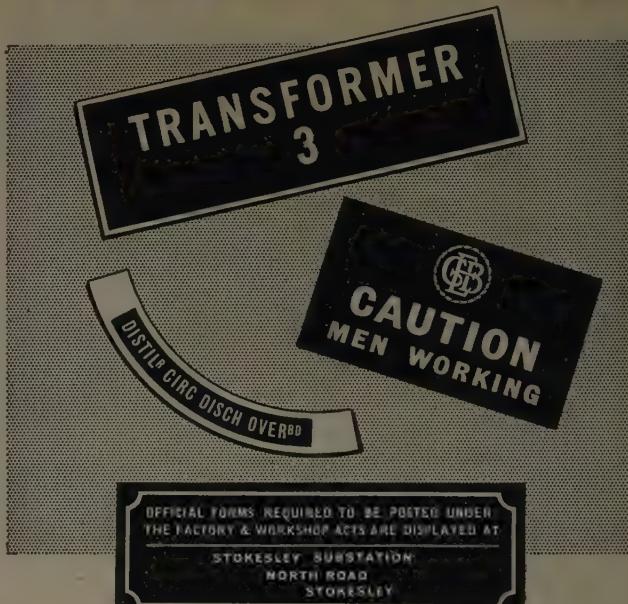
For fluorescent lamps and overhead lighting fittings. Screwed 8" thread, male electric. Made to fit all standard boxes with two holes 7/32" diameter - 2" centres diametrically opposed. Designed in accordance with British Standard Specification.

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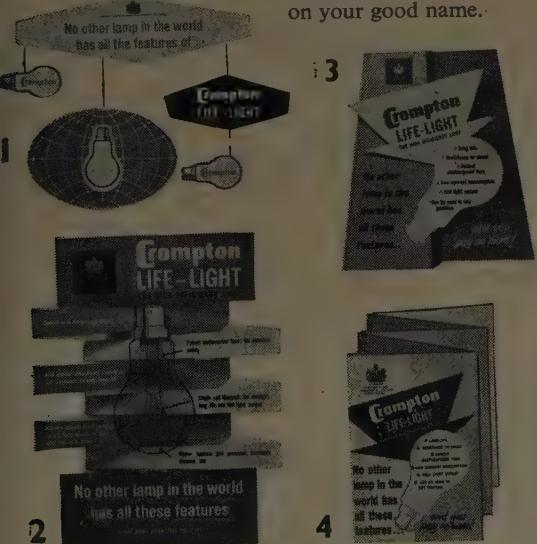
YOU KNOW WHAT THESE FEATURES OF 'LIFE-LIGHT' ARE: LONG LIFE, FULL LIGHT OUTPUT; RESISTANCE TO SHOCK; LOW CURRENT CONSUMPTION, THEY CAN BE USED ANY WAY UP; A PATENT SHATTER-PROOF FUSE. YOU KNOW WHY 'LIFE-LIGHT' LAMPS ARE BETTER—THE FULL STORY IS IN THE COUNTER LEAFLET.

## And no other lamp has this new and successful advertising

Last year, you remember, we did something entirely new in lamp advertising. We didn't use gimmicks or slogans but explained exactly *why* 'Life-light' was a better lamp. This campaign caused more comment than any lamp advertising for years and we are going on with the same theme because it is the kind of advertising that is cumulative, but we are doing far more of it. In all, these advertisements will be seen over 80 million times. So this year they will do even more to increase your sales.

## Crompton LIFE-LIGHT

To help you sell these lamps hard we are offering you this point-of-sale and display material. Use it: See your customers buy the lamp that sheds a bright light on your good name.



**1. MOBILE.** This well balanced and attractive mobile can be used in the window or in the shop.

**2. LARGE DISPLAY.** This forms the centre piece of a window display or alternatively can be used as a large showcard inside the shop.

**3. SHOWCARD.** Carries on the 'Life-light' theme. Attractive and striking to look at and takes up very little space. Use on the counter to attract attention.

**4. LEAFLETS.** These leaflets are your best aid to selling 'Life-light'. They tell the customer exactly why 'Life-light' is a better lamp. They mean repeat buying so see that they are picked up.

### DISPENSER

This compact floor dispenser which is 61 in. high and only 13 in. square is a valuable sales aid for use inside your shop.

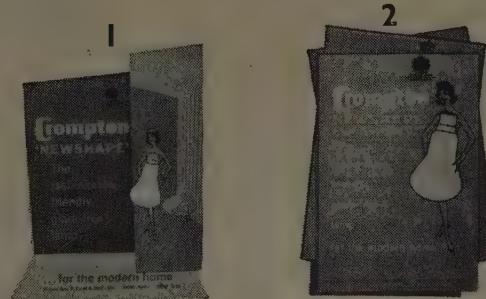


### ALSO THIS YEAR:- Sales material for the CROMPTON 'NEWSHAPE' LAMP

**1. SHOWCARD.** Clean, bright and attractive. Use it to draw attention to this very popular lamp.

**2. LEAFLETS.** Keep them near showcard; they are powerful selling aids.

Note. Crompton 'Newshape' has the same internal construction as 'Life-light': It is thus as much in advance of other lamps with this new bulb as 'Life-light' is in advance of other lamps of the ordinary shape.



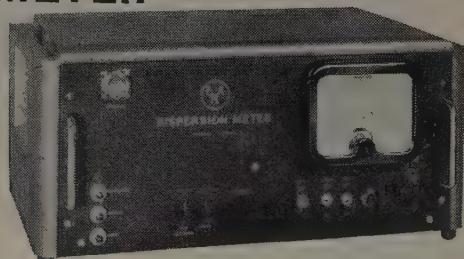


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5-300 amp. 250-500 Volt

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Through  
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Switch Socket with Cover and  
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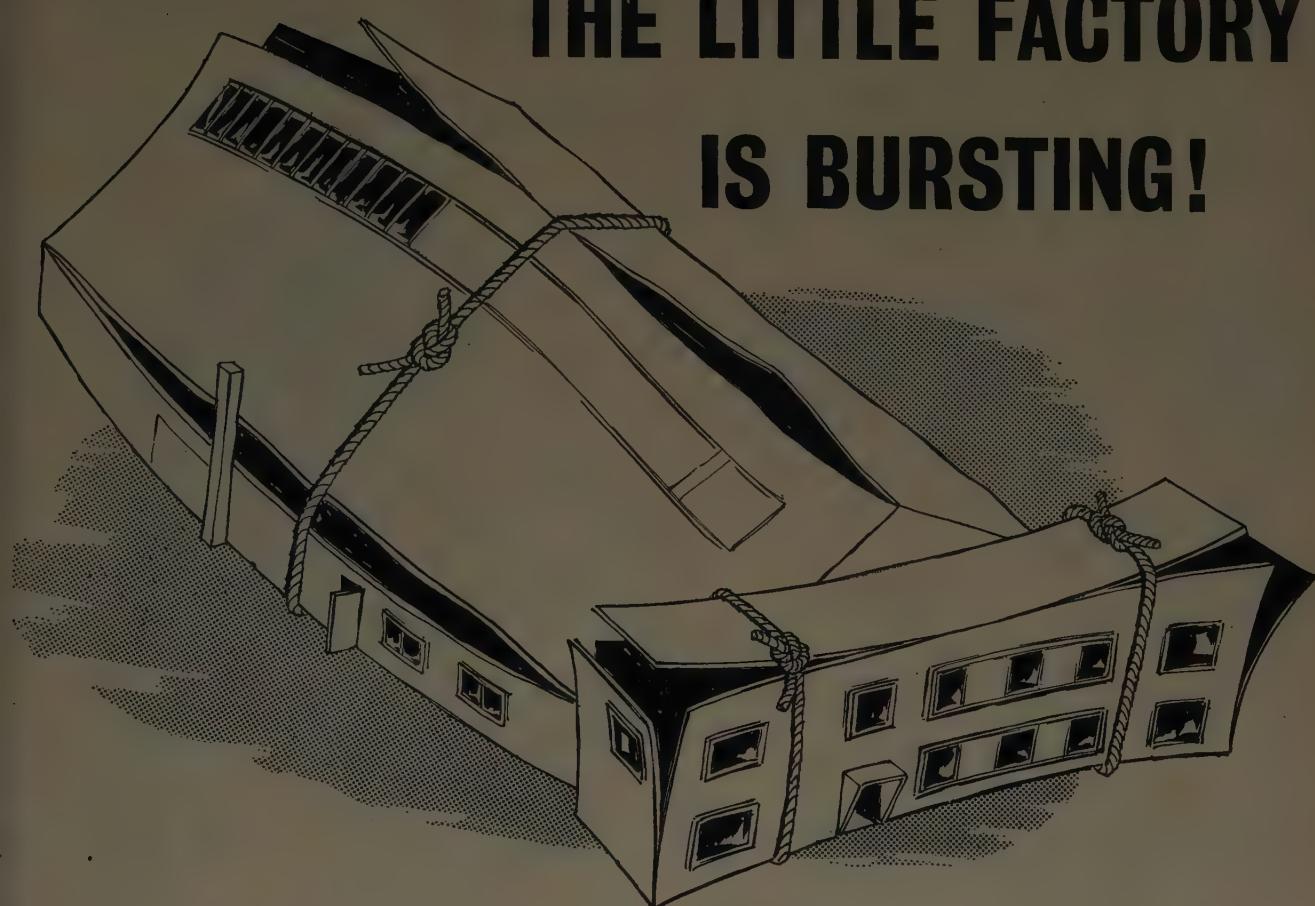
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Plain  
Socket

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FOR ELECTRIC VEHICLES AND TRUCKS

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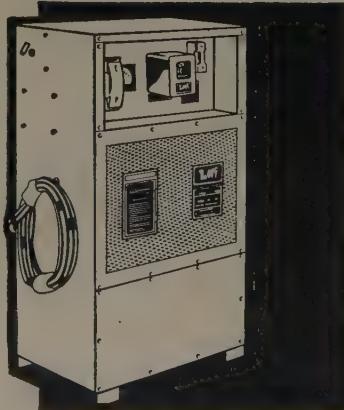
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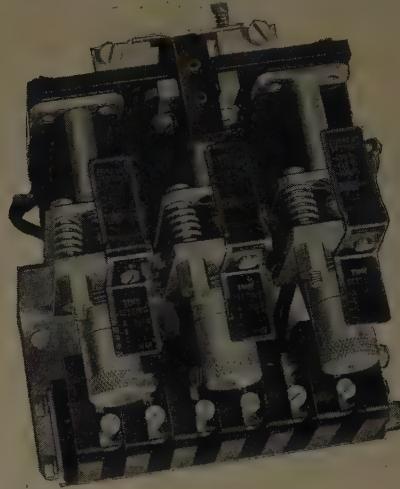
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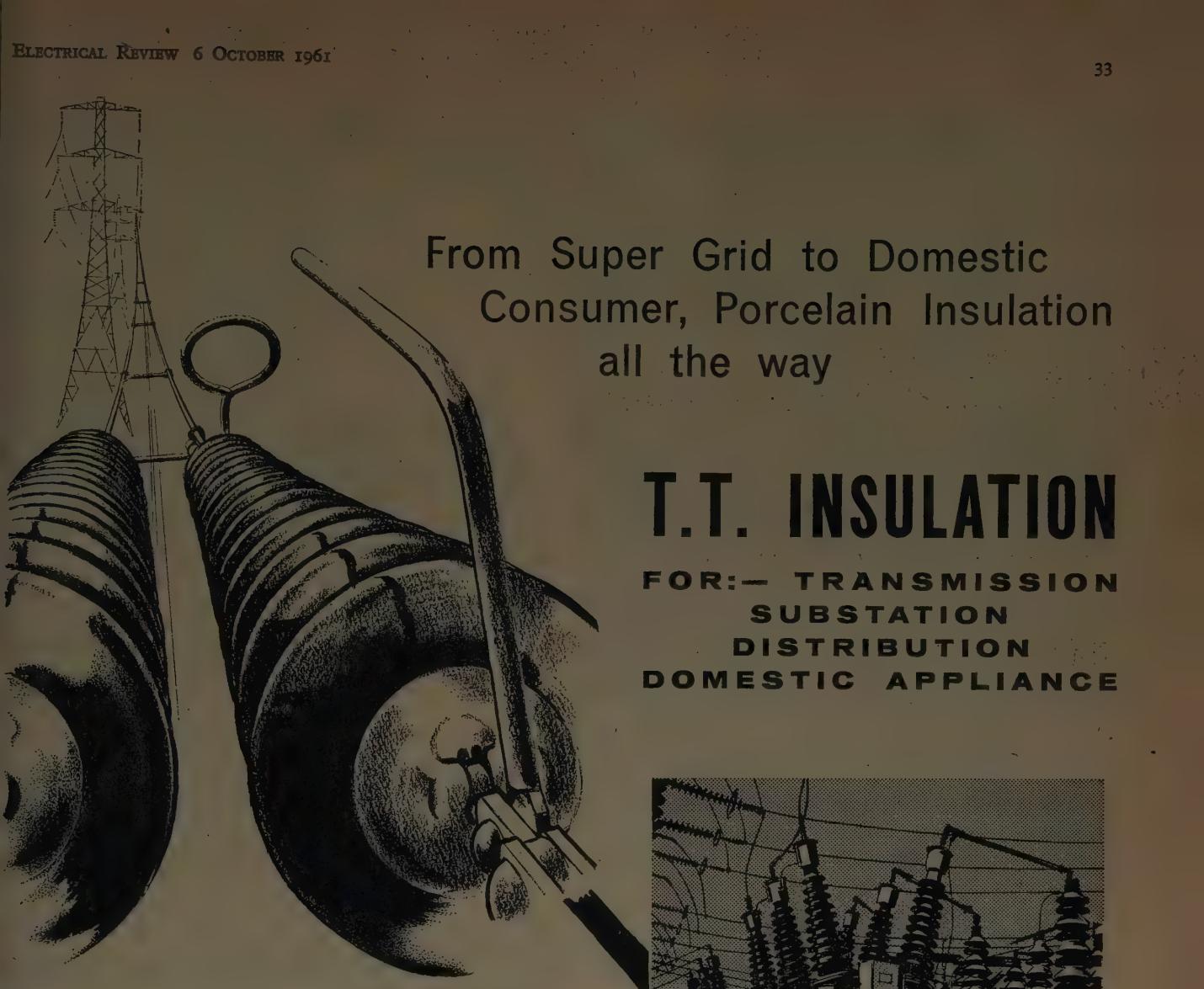
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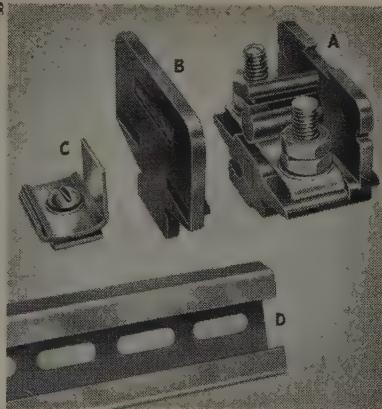
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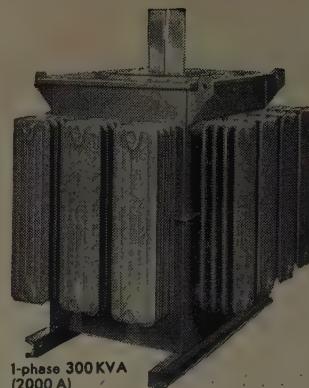


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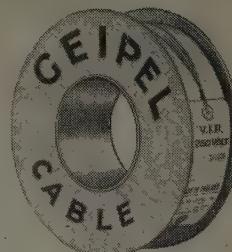
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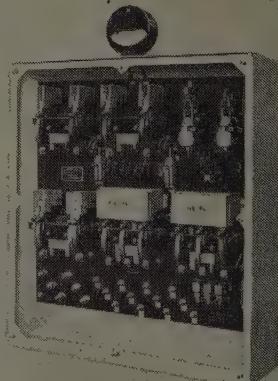
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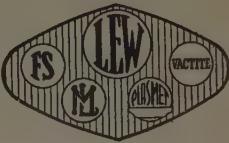
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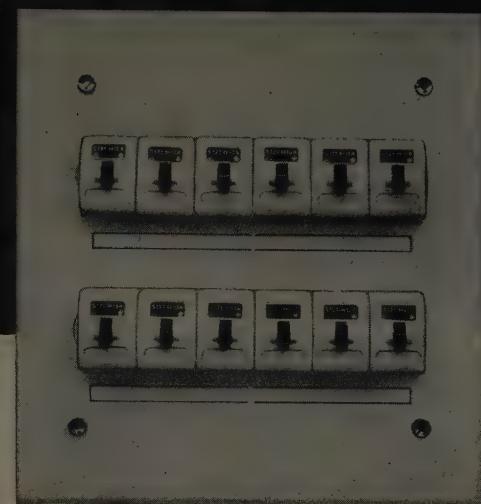


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MINIATURE  
CIRCUIT  
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54549

STOTZ miniature circuit breakers for the protection of lighting and power circuits.

MODEL S 201

Exceptionally high rupture capacity (10,000 Amps) and unusually small dimensions.



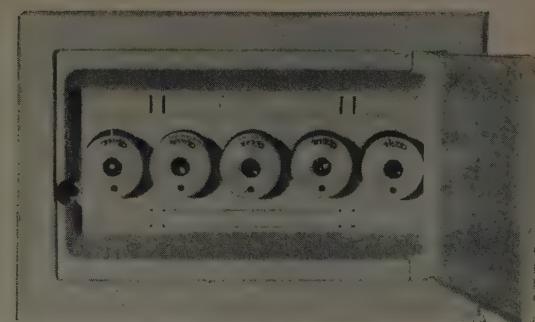
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STOTZ miniature circuit breakers screw in pattern with push button action and only 78 mm. high.

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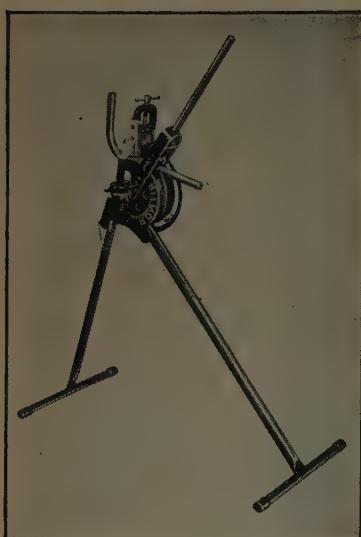
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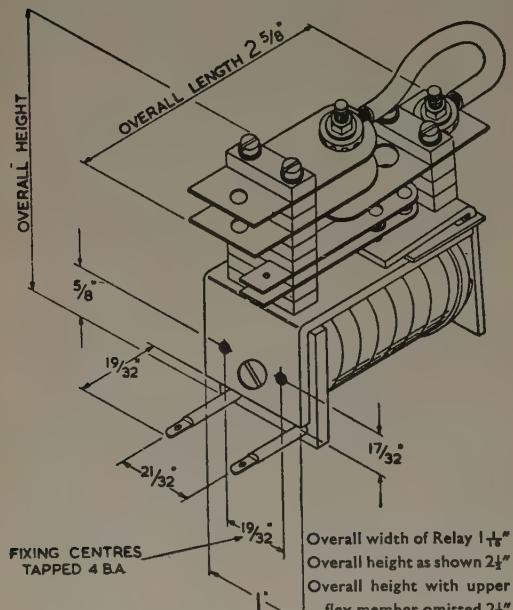
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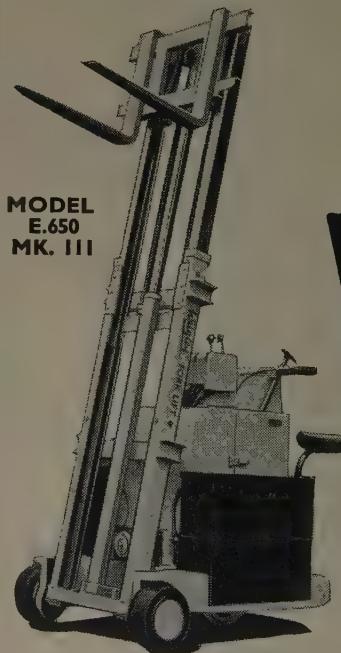
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Hot foot on the successful installation of automatic frost protection by under-turf heating at football fields, comes the Greyhound Racing Association's contract for the G.E.C. to install—for the first time—under-turf heating at three of their tracks. Harringay London, and Belle Vue Manchester have been completed; White City London will be laid in the near future.

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*Close-up view of the specially designed David Brown tractor which simultaneously slits the turf and lays the cable.*

*Below:*  
*General view of the Harringay track with cable laying in progress.*



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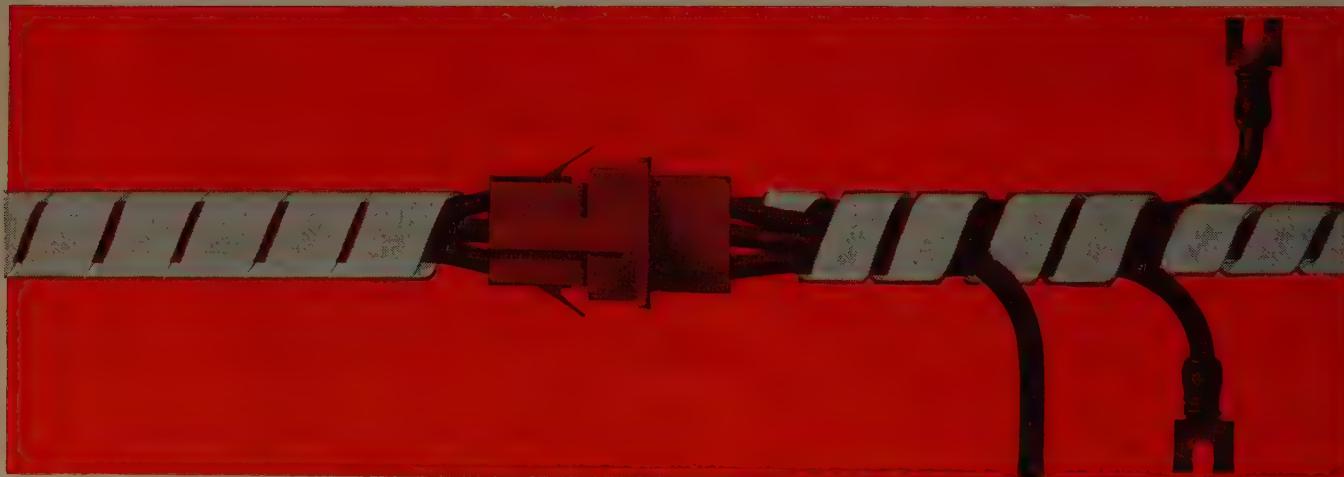
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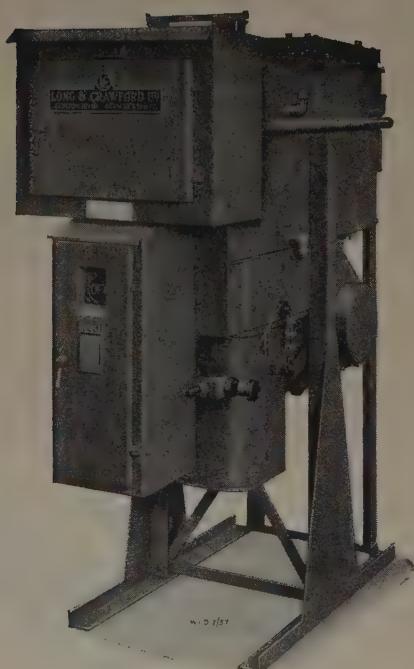
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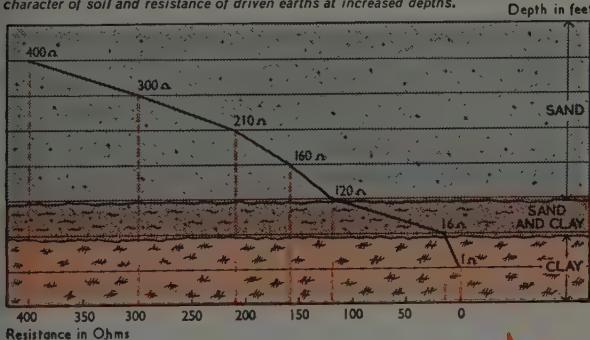
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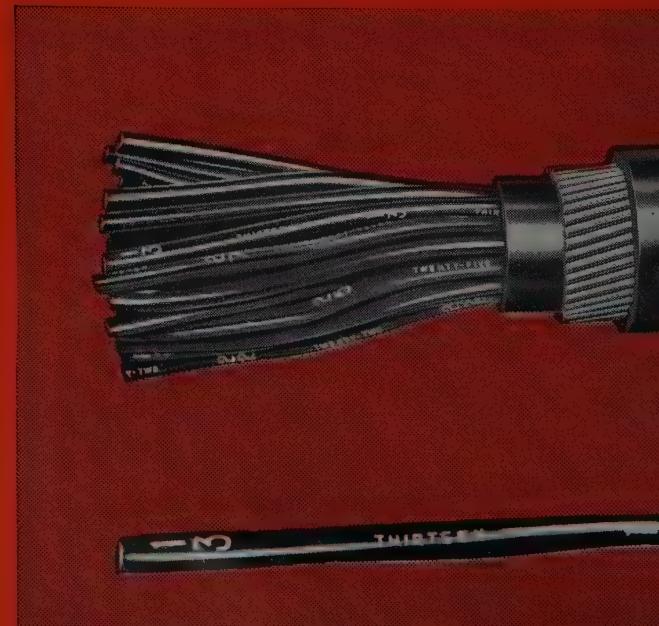
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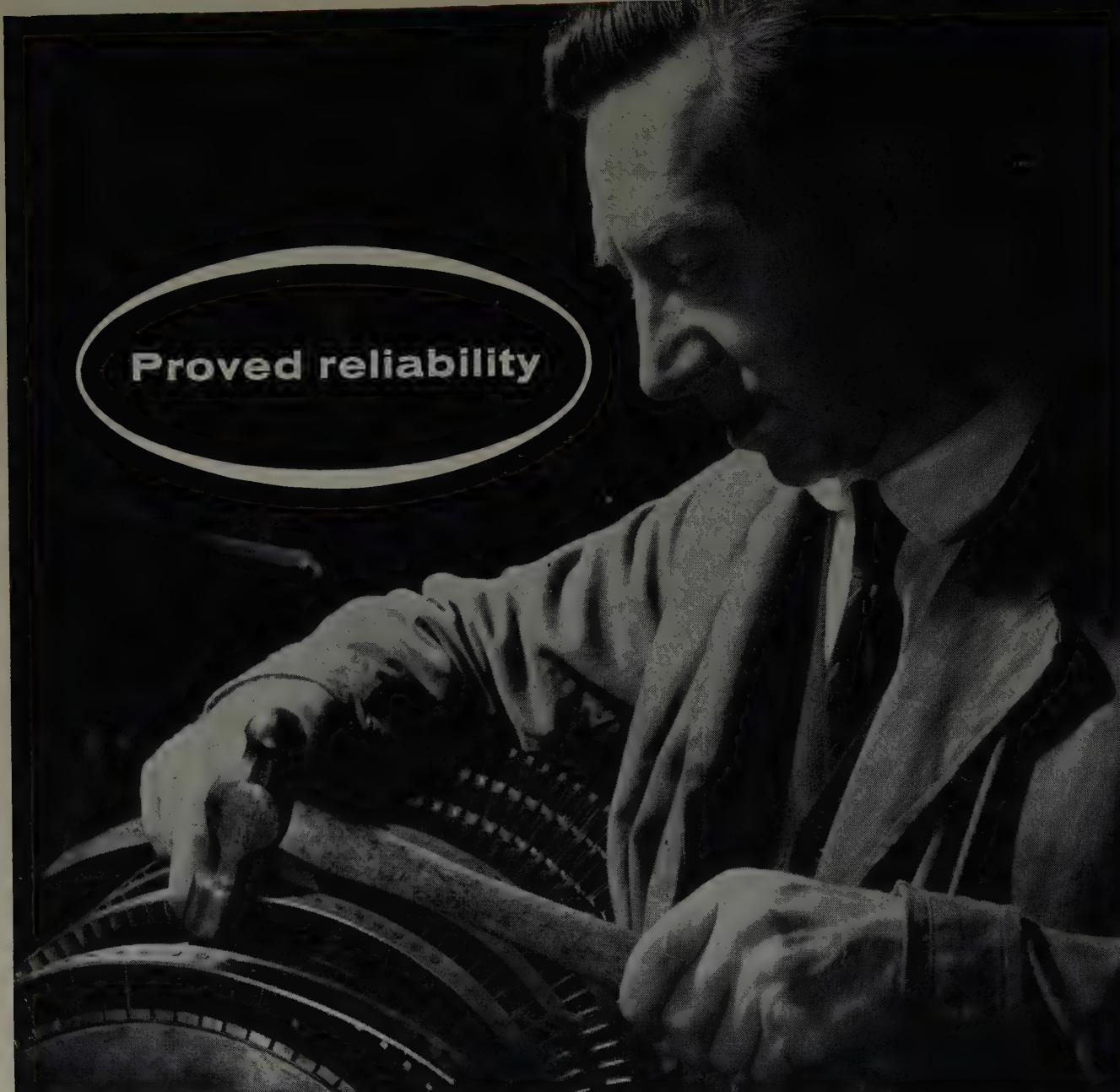
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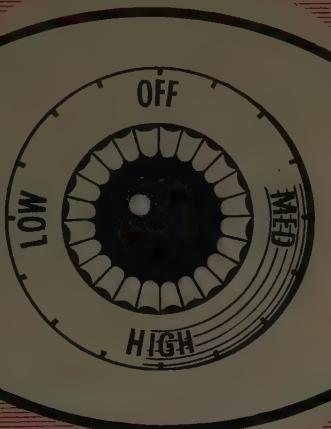


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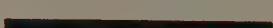
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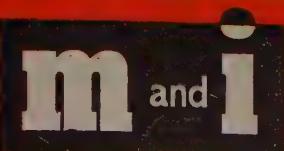


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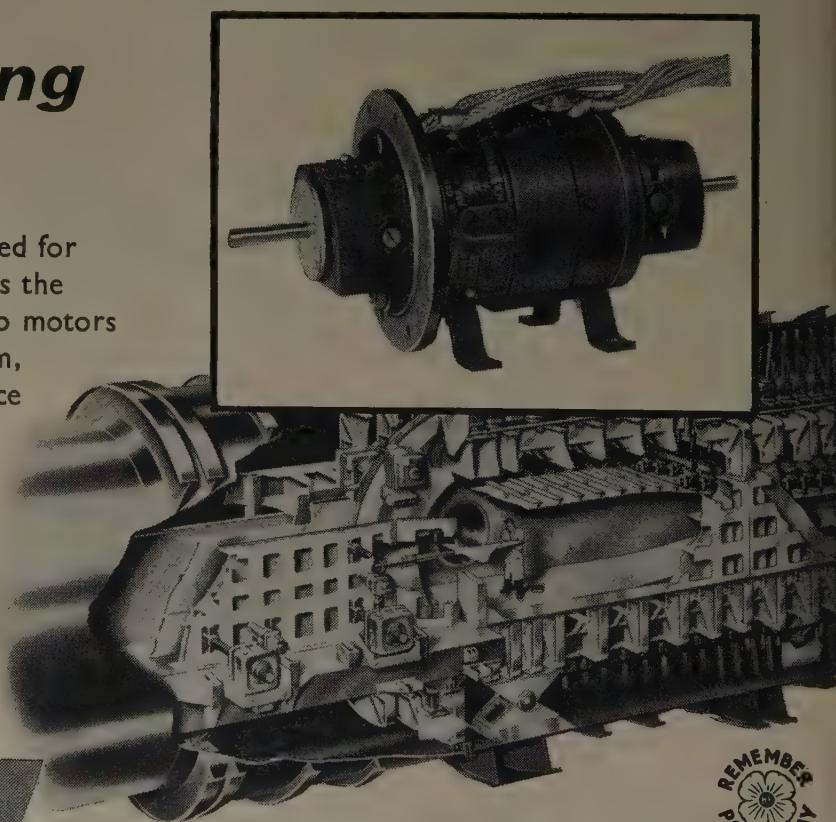
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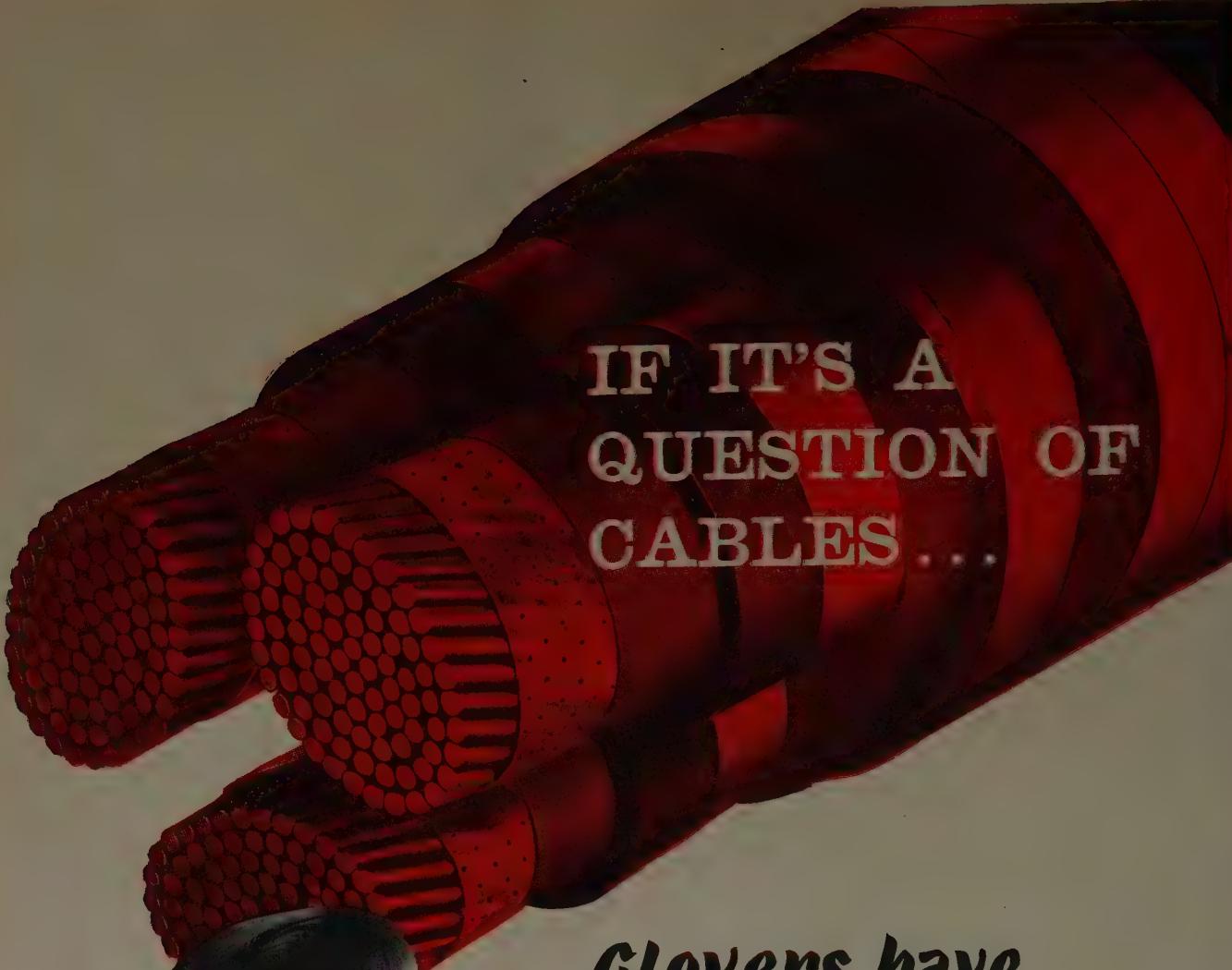
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# ELECTRICAL REVIEW

Eighty-Ninth Year of Publication

Friday 6 October 1961 Volume 169 No 14

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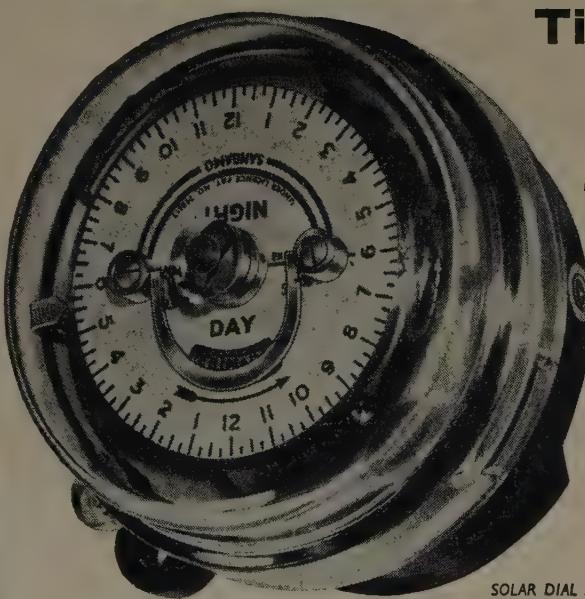
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# ELECTRICAL REVIEW

6 October 1961 Vol. 169 No. 14 Established 1872

## *Towards Greater Specialisation*

LAST night Mr. G. C. S. Lucas gave his inaugural address as President of the Institution of Electrical Engineers and thereby opened the 91st session of that body. The Institution has had a long and distinguished history, developing from the perhaps modest Society of Telegraph Engineers as it was in 1871 to the flourishing professional body which it is today. During its long history the Institution has undergone many changes with the object of fulfilling its aims and objectives more efficiently, and ensuring that all members derive the maximum benefit from its proceedings and activities. Throughout the years the Institution has adapted itself very well to changing circumstances in the rapidly developing field of electrical engineering.

In recent years electrical engineering has advanced at a phenomenal rate and, in fact, completely new branches of the art have come into being. Throughout this period the Institution has been held on a straight course by its secretary, Mr. W. K. Brasher, who retires at the end of the present session, and much of the success of the Institution today has been due to his efforts.

During the coming session another change in the structure of the Institution is to take place and this, as mentioned on page 524 of last week's issue, is concerned with the specialised sections. The present arrangement of four sections is to be replaced by three divisions representing electronics, power, and general interests. Each of these divisions will be broadly based, and will consist of about ten technical groups, each specialising in one particular facet of the subject with which the division is concerned. This will undoubtedly lead to the production of highly specialised papers which may be of limited interest to the general membership of the Institution.

Nevertheless, the greater degree of specialisation afforded by the new arrangements will enable each member to identify himself more closely with the narrower fields of activity with which the technical groups will be concerned. It will also be possible for many more members to take a more active part in Institution proceedings, particularly in connection with the technical group committees. It is to be hoped that the numerous committees which will result from the reorganisation will not prove to be too unwieldy.

There may be opposition to this new structure: corporate members will have an opportunity to express their opinions at a special general meeting which is to be held in London on Thursday, 2nd November, to obtain approval for the necessary changes in the by-laws. It must be remembered, however, that these changes are being made to enable the Institution to offer better service to its members and so far as we can judge

each member will in future be able to be better informed, and in more detail in his own particular field, than has been the case in the past. When the idea of the specialised sections was first suggested just over 40 years ago there was a great deal of objection to it, but eventually the sections as we know them today were formed and the idea proved successful. The new structure may seem strange at first but in the long run it should be an improvement.

### VALUE OF EXHIBITIONS

Speaking as chairman of the Export Council for Europe at the second annual Electrical Engineers Exhibition dinner last week, Sir William McFadzean urged the necessity for this country and its manufacturers to project the right image of themselves. Only thus could they hope to increase exports substantially, and there was no better means of projection than a really efficiently staged display of first-class products. Sir William also thought that manufacturers should not be afraid of having their products compared with those of foreign make and he welcomed the trend towards the "internationalisation" of British exhibitions.

The opening of the Electrical Engineers Exhibition to foreign manufacturers has been discussed on more than one occasion but the general feeling of exhibitors has been against it. The present facilities are probably too limited to permit this wider scope and no doubt this has made the present exhibitors fear that they might be restricted or even crowded out. It is clear, however, that the organising company has the matter in mind, for the chairman, Mr. R. F. Mathieson, said that they might have to re-examine the present restriction of the Exhibition to British companies. If it is considered possible to open the display to foreign manufacturers we feel, with Sir William McFadzean, that British firms should not fear comparisons. British electrical goods generally are as good as any. If there are examples which fall short of a reasonable standard, comparison will force the makers to improve them.

### FLEXIBLE CONNECTORS

The death of a girl in a Lancashire town last week is a reminder that Continental appliances are still being sold here with flex which does not conform to British practice. In this case it was a hair dryer and the earth core of the flex was coloured red. Through the good offices of the British Standards Institution many Continental appliance makers are now supplying flex with a green and yellow striped earth wire instead of the green marking used in this country. Unfortunately there is no obligation upon importers and retailers to make sure that there can be no errors in connecting plugs to the flex attached to the appliances.

It is probably impossible to "educate" importers in this matter, nor is there any power to force retailers to ensure the safety of their customers. Prohibition of the importation of appliances fitted with flex would appear to be a safeguard but this would mean the

### SPECIAL DOMESTIC ISSUE

The annual Domestic Issue of the *Electrical Review* appears next Friday. It will contain a 52-page illustrated supplement covering the wide range of electrical appliances now available and authoritative articles on various aspects of electricity in the home

connection of flex by retailers (or by customers), not always an easy matter and certainly open to even more risk. Legislation for imposing penalties on those selling appliances with wrongly-connected flex would be difficult to enforce. Prosecution after a fatality would be too late. The best alternative seems to be to acquaint all retailers of electrical appliances with the danger and this can best be done by the electrical industry. Already the Electrical Contractors' Association has alerted its members and the Electricity Boards have also issued warnings.

Even if all retailers are made aware of the importance of seeing that buyers are warned when Continental flex is fitted to appliances, there is no guarantee that the buyers will connect plugs correctly—but this, of course, applies equally to the connection of standard British flex. The terminals of most three-pin plugs are now plainly marked and if the earth core is also labelled upon sale there should be little trouble in the first instance. But upon subsequent replacement of a plug the earth tag on the flex will probably have disappeared and there may be confusion.

All this may suggest that the problem is unsolvable but it can be hoped that as the public is made more aware of the importance of correct connection of flex to appliances such incidents as the one mentioned at the beginning will be rarer than they already are.

### ELECTRIC SHOCK TREATMENT

A number of organisations concerned with the application of artificial respiration—including the British Red Cross Society and the Royal Life Saving Society—have recently announced that the mouth-to-mouth system of resuscitation has been adopted as the preferred method. In this, the casualty is laid on his back and the rescuer exhales into his mouth, at the same time closing the casualty's nostrils. This is repeated at about 4 or 5 second intervals. The societies are preparing instruction manuals on this technique which they hope to make generally available by the beginning of next year. The method, which is widely used in Australia and Scandinavia, is being considered by a committee of the Medical Research Council.

An illustrated description of the method will be published in an early issue of the *Electrical Review*. This description will be arranged in a manner suitable for attaching to this journal's wall chart dealing with apparent death from electric shock, so that either the new or the previously accepted Holger Nielsen method can be used, according to the past experience and training of the rescuer.

# ELECTRICITY SUPPLY RESEARCH

## What the C.E.G.B. is Doing

In its annual report for the year ended 31st March, 1961, reviewed in our last issue, the Central Electricity Generating Board shows that it continues to expand its facilities for research and development work. The extension of the Central Electricity Research Laboratories at Leatherhead proceeded and parts were brought into use. New laboratories were built at Berkeley for nuclear work, and plans for an engineering laboratory to be constructed at Marchwood, near Southampton, were approved by the Board

AMONG the more interesting items of research and development work which are being conducted by the Board is an investigation into the possibility of reducing the size of power station boiler combustion chambers so that they can convert the energy in the fuel more efficiently and be more reliable in operation. In another investigation full-scale power station oil burners are being tested in a pilot rig. The objects are to improve the design of burners, to reduce the amount of excess combustion air, to reduce sulphuric acid attack in the boilers, and to reduce the amount of sulphur trioxide in the flue gases. Two coal-burning rigs, nearing completion, will be used to study coal-burning systems over a wide range of operating conditions, and special attention is being given to deposition and corrosion in superheater steels at temperatures between 1,050 and 1,300°F, and to combustion at temperatures above the melting point of the ash.

### Field Cycle

Work on the theory and practice of advanced steam-raising plant has been directed towards higher steam temperatures. The experimental high-temperature superheater designed to study the Field cycle is being used to provide information on combustion and heat transfer in pulverised-coal flames, and to raise steam to higher temperatures than is possible in existing boilers. Preliminary investigations of flame temperatures and emissivity in a water-cooled chamber were completed in the Field cycle rig. When the superheater has been reconstructed with tubes and headers of high-temperature alloys, a further series of trials will be carried out.

At high temperatures and pressures, minute quantities of impurities in water and steam may foul and corrode boiler tubes and turbines. Work on boiler feed water has been concentrated on removing such impurities and an experimental installation is being used to study the causes and mechanism of attacks from this source upon the metals used in boilers and turbines. Basic studies are being made of the physical chemistry of steam at temperatures above the critical temperature and pressure of water.

The erosion of blades by water droplets has not normally been very serious in small steam turbines because they strike the blade at a relatively low speed. Conditions are more severe in the turbines now being installed, and

a high-speed rotating disc rig has been built for tests on the erosion caused by the impact of water on various materials and under varying conditions. A new form of high-speed camera has been built to record the movements of droplets at high speeds. A simple optical system for observing droplets moving at lower speeds in a turbine exhaust has been developed in the South Eastern Region, and means of measuring the energy of the droplets are being examined. In addition to the work in the Board's own laboratories, research is supported at Cambridge University on the deformation of solids by liquids striking them at high velocity, and at Liverpool University on the behaviour of wet steam.

Power station plant design and development in recent years has concentrated on progressively larger and more powerful units, but further substantial increases in operating temperatures may not be practicable with conventional designs. An alternative means of improving efficiency would be to produce gas from coal for use in combined thermal cycles. For example, the gas could be burnt in a gas turbine and the exhaust could be used in the combustion of the fuel residue to raise steam in plant at the present range of temperatures. Detailed design studies of plant of this type have been started, together with the associated engineering experimental work.

### Power Storage

Economic methods of storing power would be most valuable and the possibility of storing energy in the form of compressed air has been suggested in several countries. The Board has made preliminary economic and technical feasibility studies which show that a scheme to compress air during off-peak periods, and to use it in gas turbines coupled to electrical generators during peak periods might ultimately help to economise in capital costs. Design studies have begun on this investigation.

The economic and technical possibilities of several direct-generation processes, which may be of long-term interest, are being studied. The fuel cell, which converts chemical (fuel) energy directly into electricity, in principle enables higher thermodynamic efficiencies to be attained than is possible in existing heat engines. It is probably necessary for the fuel in the cell to be a gas, so that this research is linked with that on gasification mentioned

above. In magnetohydrodynamic (MHD) generation, an electrically conducting gas is passed through a magnetic field and its energy is converted into electricity. The main problems arise from the high temperatures (2,000 to 3,000°C) which may be necessary, and from the extraction of electrical energy into an external circuit. Thermionic generation, in which electrons are transferred from a hot cathode surface to a cooler anode across an evacuated space, is also being studied. Problems include the nature and behaviour of the electrode surfaces, securing an acceptable life for the materials, and engineering difficulties. Thermo-electric generation has also been examined, but the prospects do not look sufficiently promising to justify experimental work by the Board.

### Direct and Conventional Generation

Some of these direct-generation methods, particularly MHD and thermionic generation, involve such high temperatures that their "waste heat" is hot enough for steam raising: schemes to combine them with conventional power station plant to generate electricity at increased overall efficiency are therefore being considered.

Work is proceeding to further the operational safety, reliability and economy of the reactors in the Generating Board's nuclear power stations; the background and long-term work will be done mainly at the Berkeley Nuclear Laboratories. Research carried out by the Board and the United Kingdom Atomic Energy Authority shows that a significant improvement in the life of fuel element cans is likely if a magnesium-zirconium alloy is used instead of the magnesium alloy can supplied to the first reactors.

In co-operation with the U.K.A.E.A., the long-term behaviour of materials under irradiation has been

examined, with particular attention to the way in which irradiation can accelerate creep-relaxation effects in graphite, iron and zirconium. Other work concentrated on the reactions between graphite and carbon-dioxide, and on changes in the mechanical properties of graphite at various stages of oxidation. A large number of graphite samples were prepared and their physical and chemical properties measured in preparation for their insertion in reactors; changes in these properties will be monitored over the years of operation.

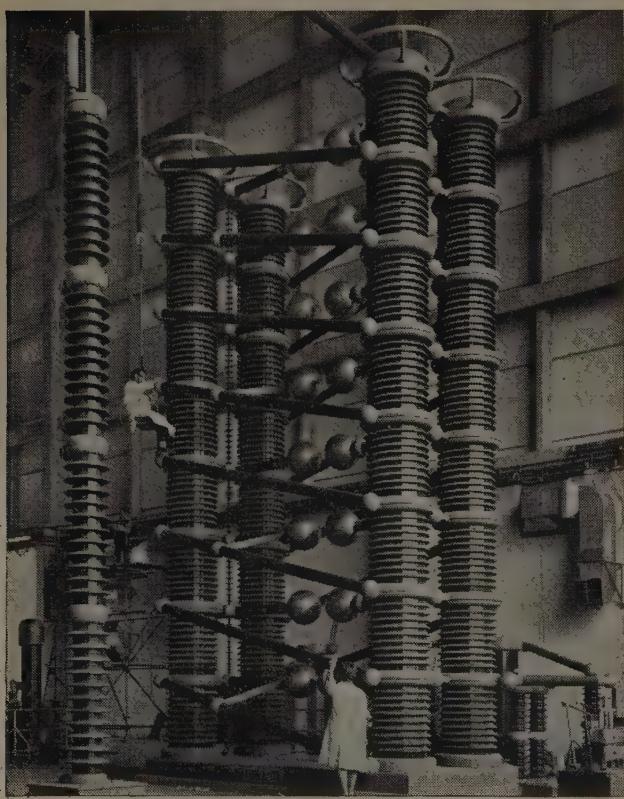
The Board's computers were engaged upon a considerable amount of mathematical analysis and calculations on fault "simulation" studies. The IBM709 digital computer and PACE analogue computer were extensively used to study the expected behaviour of nuclear reactors and their control systems under the whole range of operating conditions. Preliminary results were obtained on the detailed steady-state distribution of power in a large-diameter reactor core. A two-dimensional programme developed by the U.K.A.E.A. for the IBM709 computer was used to predict the disturbances in power and in the distribution of fuel temperature caused by control rods and flattening absorbers; the best distribution of such absorbers can be determined from the predictions.

### High Voltage Transmission

As a result of the Board's decision to raise the main transmission voltage to 400 kV, the programme for high-voltage research was revised to fill existing gaps in knowledge of 400 kV systems, and to plan ahead for research on systems designed to work at considerably higher voltages. Information is now almost complete on the requirements of outdoor insulation for 400 kV lines, plant and equipment subjected to industrial pollution, and an extension of the insulator-testing facilities at Brighton is being planned to deal with 400 kV and other h.v. systems exposed to salt sea spray. A new double-circuit, single-phase, experimental test line was designed for operation at Leatherhead at voltages up to 840 kV for studies of corona loss and radio interference. A large mobile laboratory unit equipped to take measurements on the grid system will make special tests on high-voltage switchgear and examine the performance of protective gear.

In high-voltage systems, the importance of insulating materials is increasing; the properties and possibilities of new materials, including organic and inorganic polymers, are being examined, particularly for underground cables.

A complex engineering problem arose from the effects of wind on the conductors of the Severn crossing. This span is the sixth longest in the world and uses 1.7in diameter conductors (believed to be the largest in the world), which are strung with a normal vertical separation of 27ft between conductors. Under certain wind conditions, the conductors oscillate so far vertically that they pass each other in mid-air. In weather conditions causing severe oscillation, clearances are reduced to the point where short circuits occur and the lines are automatically put out of service by protective gear. This form of oscillation is well known when there is ice on the conductors, but very rarely occurs otherwise in this country. Investigations to ascertain the precise cause of the trouble and how to prevent it, are in hand in order to safeguard the Severn and other long crossings. Theoretical studies of the dynamics and aerodynamics of overhead line struc-



A research worker at the C.E.G.B. laboratories at Leatherhead adjusting the 4,000 kV impulse generator

tures have been accompanied by model work, under contract, at Imperial College, London, and by direct observations by research staff and by cameras synchronised with the faults at the Severn crossing. Results are incomplete, but they have enabled recommendations to be made for modifications to the design of conductors for the Thames crossing at Northfleet.

### Automatic Control

The Board is pursuing a long-term study to find out to what extent automatic control can be applied to power station and grid control. Information is being collected about the operation of the system so that it can be expressed in terms which automatic machines can handle, i.e. numerically, to ensure that any partial automatic control that may be introduced is consistent with manual control. This study includes tests of the response to disturbances of the whole system of interconnected generators, and analyses of the test data. An operational aid now being constructed for installation at the end of 1961 is a device for assessing automatically and continuously the "security" of the pattern of power flow through the 275 kV network. This device displays continuously what the effect would be on a sector of the supply system of cutting out any given line, and so indicates to the operator where there is a risk of other lines becoming overloaded if any one of them becomes unserviceable.

Another project is a trial under actual operating conditions of a system to control generating plant by means of an automatic computer at a grid control centre. To avoid extensive experiments on the grid system, an electronic "model" of part of the system is being designed for various possible control schemes to be tried and sufficient reliability ensured before any operational trial is undertaken. Other studies in hand point the way to experimental installations in power stations to make the generating plant obey the commands of the grid control centre computer and to "optimise" continuously the performance of individual stations. The early part of this work now in progress includes measuring and recording the transient response to disturbances of boilers and other steam plant.

### Hydraulic Coal Transport

The hydraulic transport of coal is being examined to see whether its economic and technical possibilities are of interest to the Board. By this method of transport energy a mixture of coal and water is transmitted through pipelines to the centres where it is to be used. A feasibility study showed that hydraulic transport of coal to power stations in this way might have advantages, but many practical and economic aspects have yet to be examined. Two design studies have been launched. One is a hydraulic transport system for pumping coal to a large modern power station sited near a coalfield and, associated with this, plans are being made for an experimental one mile long pipeline to provide information on the rate of wear and corrosion in coal-transport pipes. The second design study is for a scheme to pump coal over a distance of 150 miles. The supporting experimental work seeks information on the flow of coal and water mixtures in pipes and, in particular, on the effect of different sizes of coal particles. The removal of water

from the coal and the thermal drying of coal are also being investigated to improve existing methods and develop new ones.

### Leatherhead Laboratories

The extension, modification and equipment of the Leatherhead laboratories will cost about £2 million and will provide increased facilities for research in high-voltage transmission, physics, electrical, mechanical and civil engineering, chemistry, biology and materials. Two wings of the new main block had been occupied by last March and the high-voltage laboratories, begun in July, 1960, were also partially occupied. The high-voltage laboratories have a total floor area of 35,000 sq ft with a main high-voltage bay of 12,000 sq ft and 70ft clear headroom. The test facilities will include a 4,000 kV impulse generator and power-frequency voltages up to 1,200 kV. Research will be carried out on transmission systems operating beyond the new main transmission voltage of 400 kV. Comprehensive facilities for high-voltage d.c. research up to 1,000 kV are being installed. Heavy current equipment capable of supplying a maximum current of 100,000 A will be available. The laboratories should be fully in use by the end of this year. The existing laboratories at Leatherhead are being modified and re-equipped for research on materials used in power stations and on the transmission system. Special emphasis will be given to research on high-temperature steels.

### I.E.E. Benevolent Fund

THE 1960-61 report of the Court of Governors of the Benevolent Fund of the Institution of Electrical Engineers shows that at 30th June last the capital of the general fund stood at £199,242 (against £169,703 at 30th June, 1960) and that of "The Chesters" Trust at £19,812 (against £19,131). The income for the year from all sources amounted to £22,279 (£22,322), of which £17,478 (£18,373) came from subscriptions and donations.

The support received from the local centres has again been most encouraging and the amounts they have raised by special functions and collections have increased the fund's resources substantially. The general support from the electrical industry is also acknowledged. During the year under review, the income from subscriptions showed a slight decrease, but at the same time, the calls upon the fund were more numerous. If the cost of living continues to rise, larger grants will have to be made to beneficiaries already receiving assistance. It is therefore essential that the subscription income should show an increase each year; 126 beneficiaries and dependants were assisted during the past year. The Court again appeals to all members who have not done so to consider subscribing under deed of covenant; £2,327 was recovered from the Inland Revenue in this way during the past twelve months.

The governors have been called upon to disburse a larger sum in grants to beneficiaries during the year, but they are happy to have been able to meet all requests for assistance. The expense of investigating applications and giving effective help in deserving cases has of necessity increased the administrative costs, while at "The Chesters" wage awards and higher prices for materials have increased the expenditure for essential repairs and decorations to houses, as well as on the maintenance of the grounds. During the year grants amounted to £11,751 (£10,461), while maintenance of properties cost £3,507 (£2,030), and management expenses were £2,645 (£2,129).

# AREA BOARD TRADING

## Comparative Review of the

THE paradox of higher sales leading to a lower surplus, which was an outstanding feature of the consolidated results of the electricity supply industry in England and Wales (reviewed last week) is reflected in varying degrees in the reports of the individual Area Boards. While the C.E.G.B. was forced by the unexpected rise in demand to generate 5,000 million kWh at above average cost, the consumer, benefiting from the operation of the two-part tariff, was for the third year running getting his current at a lower average price. Thus, although sales of electricity increased by 12.1 per cent, revenue increased by only 10.2 per cent. The principal increase in Area Board costs, as compared with 1959-60, was £41.2 million for the purchase of electricity. This arose directly from increased sales, the higher fuel cost passed on to them by the C.E.G.B. being generally offset by improved load factors. The Area Boards' results were also adversely affected by pay awards, the growth of capital charges, the higher rate poundages and the lower surpluses from contracting and sales of fittings.

Nevertheless, three Boards (the Southern, South Eastern and North Eastern) succeeded in achieving a higher surplus than in the previous year. The Southern Board, which raised its surplus by £1,320,000 to £2,760,000, attributes this success to the abnormally high increase in the sales of electricity, which, owing to favourable weather conditions was not accompanied by a corresponding increase in the charge for maximum demand. Sales to domestic consumers rose by 20.8 per cent and the average price per kWh fell from 1.624d to 1.552d.

The South Eastern Board, which increased its small 1959-60 surplus of £142,000 to one of £972,000, puts particular emphasis on the reduction in its operating costs. It points out that whereas the unit cost of electricity purchased by the Board during the past 11 years has gone up by 37 per cent, retail prices by 53 per cent and weekly wage rates by 76 per cent, the Board's operating unit cost has fallen by 32 per cent. Unlike the Southern Board, however, the South Eastern Board raised its domestic tariffs during the year. Domestic consumers now account for 50.7 per cent of total consumption and sales to this group rose by 17 per cent. The influence of the cooler summer and mild winter on this large domestic load led to a significant improvement in load factor.

Although a predominantly industrial region, the North Eastern Board recorded a rise of 18.6 per cent in domestic consumption and its surplus increased by £540,000 to £1,862,000.

### Contracting and Appliance Sales

An important contributory cause of the industry's lower surplus was the fall of £3 million in the net surplus on contracting and sales of fittings. The main reason for this was the fall of £8.4 million in the sale of appliances on hire-purchase. Cash sales increased by £900,000.

The total turnover of Electricity Board showrooms fell from £51 million to £43.5 million but this was offset to some extent by an improved turnover on contracting (£20.1 million against £18.5 million). The gross profit on contracting rose from £5.1 million to £5.3 million, while the gross profit on sales of fittings declined from £16.9 million to £10 million.

The South Western Board's turnover on contracting activities increased by 12 per cent and, to improve productivity, an advisory panel of technical staff with wide experience of installation contracting was charged with recommending the most economical use of wiring materials and improved installation techniques. New procedures for the full inspection and testing of installations are also said to have proved their worth by rationalising and codifying practice in this field. The Board co-operates with private contractors through seven liaison groups.

The Eastern Board had the highest total of contracting business (£3.1 million) and they say that the fall of

### CONNECTION OF FARMS

Area Board	Estimated Number of Farms in Area	Farms Connected	
		1st April, 1948 Number	31st March, 1961 per cent
London ...	82	81	98.8 82 100.0
South Eastern ...	14,400	5,557	38.6 12,037 83.6
Southern ...	25,776	8,015	31.1 23,347 90.6
South Western ...	32,250	6,330	19.6 22,257 69.0
Eastern ...	31,600	9,898	31.3 27,397 86.7
East Midlands ...	27,900	11,433	41.7 25,986 93.1
Midlands ...	26,600	7,779	29.2 23,257 87.4
South Wales ...	23,500	3,016	12.8 16,631 70.8
M. and North Wales	34,120	8,810	25.8 25,722 75.4
Yorkshire ...	21,291	8,393	39.4 20,372 95.7
North Eastern ...	18,838	4,227	22.4 16,157 85.8
North Western ...	24,669	13,004	52.7 22,131 89.7
TOTALS ...	281,026	86,543	30.8 235,376 83.8

appliance sales this year has clearly demonstrated the "value of a stable and profitable wiring business." The Merseyside and North Wales Board report a "considerable increase in the amount of installation work" including industrial premises and a further section of off-peak road heating. The contracting activities of the North Eastern Board were extended by the establishment of contracting sections in districts previously without this service, but the overall value of contracting work declined because of the reduction in work for industrial consumers.

Despite the re-introduction of hire-purchase restrictions, the volume of the South Eastern Board's showroom sales were the second highest in the Board's history. An outstanding feature of the year was the sale of a record number of cookers of which over 56 per cent were fitted with automatic timing, compared with 43 per cent in 1959-60.

Strong support for retail price maintenance comes from the South Western Board. It says that fiercer competition and difficult trading conditions were aggravated by indiscriminate price cutting. The Board believes that "public interest is best served not only by the sale of

# AND DEVELOPMENT

## Annual Reports for 1960-61

appliances properly tested for safety in operation but also by a display of a wide range to ensure freedom of choice against a background of independent expert advice." For this reason the Board takes the view that "manufacturers should be permitted to fix prices which allow a reasonable profit so that traders may provide facilities which are necessary to safeguard the long-term public interest. This is particularly true of electrical appliances where safety in design, installation and operation are of first importance."

### Load Development

Several Boards stress that a primary aim of their merchandising policy is the expansion of sales of major appliances using electricity mainly at off-peak times. Water heating is a particular favourite, but the Southern Board says that a serious obstacle in domestic premises, and particularly multi-storey flats, is the relatively small tank. The total capacity of installations supplied by this Board under the standard off-peak tariffs increased by 25 per cent to 160 MW and the electricity consumed rose by 37.5 per cent. The Yorkshire Board reports a constantly increasing demand for floor-warming installations in new buildings, particularly flats. At the end of the year 4,650 flats had been equipped and a further 4,200 were scheduled for this type of heating. Some 3,300 kW of block storage heaters and 2,500 kW of floor-warming installations were connected during the year by the North Eastern Electricity Board. In the North West there were 10,000 floor-warmed dwellings at the year end.

The Midlands Board has given special attention to the use of electro-heat in industry. Over 8,000 dwellings with floor warming were under construction in the London Board's area at the end of the year and it states that the growth of the space heating loads by thermal storage methods continues to be encouraging. At a Press conference on the Midland Board's report, Mr. H. J. Gibson, the chief commercial officer, said that with the co-operation of manufacturers they were looking into the possibilities of developing a domestic air-conditioning unit costing £60 to £70 that could be built into an outside wall. At the Board's development centre they had found that many American and Continental units were unacceptable to the British public because of their noise or because they projected too far from outside walls.

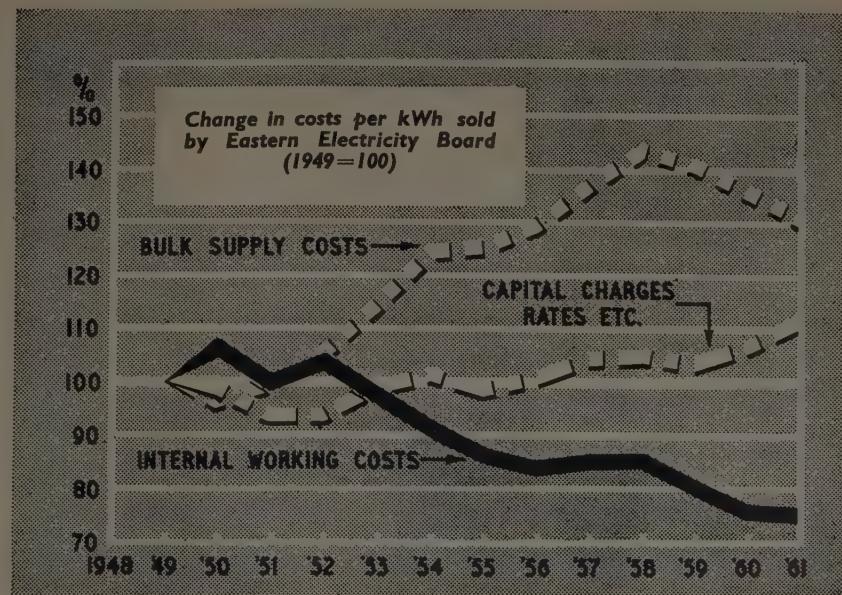
The part that attractive showrooms can play in expanding appliance sales receives wide recognition. Despite the fall in appliance sales on hire-purchase

the long-term trend is one of steady growth. To meet this the Eastern Board has launched a programme of showroom improvement and modernisation with the double aim of "providing better facilities for effective display to back up good salesmanship and identifying 'Eastern Electricity' in the public mind as the symbol of a public service run on progressive commercial lines." The presentation of "Eastern Electricity" as a public service run on progressive commercial lines is being extended to other aspects of the Board's trade and administration, for example advertising and publicity, vehicles and letter headings.

The South Wales Board has found an increasing tendency for consumers to use the larger showrooms and it is consequently concentrating its major selling activities in the large centres of population and closing small uneconomic showrooms. The London Board transferred two showrooms to better sites and carried out improvements in ten others. The South Western Board's marketing panels, established in 1959, continued to improve the efficiency of the Board's merchandising through their contribution to sound buying and stocking. Arrangements were made with a manufacturer to supply, according to the Board's specification, a low-priced self-contained 20-30 gal water heater for use in the improvement of old property and over 1,100 were installed.

### Distribution Reinforcement

It has been found difficult enough in the past to meet what has come to be regarded as normal load growth. The recent acceleration in the rate of growth of the load has increased the problems of the Boards in meeting consumers' demands while maintaining a high standard



Area Board	Year	Surplus or Deficit (—) before transfer to Reserves	Sales of Electricity				Chargeable Maximum Demand	Running Charge average price per kWh	Load factor	Contracting and Sales of Fittings				
			Average per year end Consumer Com-mercial In-dustrial			Total	000 kWh	kWh	kWh	Percentage of Total Sales		Gross Profit	Indirect Costs %	
			Total	Domestic	In-dustrial					Total Sales	Gross Profit			
London ...	1960-61	3,624,334	8,378,755	2,343	12,170	75,731	2,502	0.675	39.6	6,320,967	21.3	15.4	5.9	
	1959-60	3,673,144	7,530,870	2,046	11,069	69,910	2,385	0.671	38.1	6,032,436	24.4	14.8	9.6	
South Eastern ...	1960-61	971,728	5,910,093	2,610	8,889	160,919	1,715	0.641	42.9	5,557,823	25.08	17.8	7.2	
	1959-60	142,214	5,198,290	2,289	7,994	152,422	1,651	0.642	39.9	5,921,051	25.5	14.5	11.0	
Southern ...	1960-61	2,760,497	7,997,807	2,704	10,721	265,612	2,172	0.579	44.2	6,063,363	25.8	19.0	6.8	
	1959-60	1,439,040	6,875,482	2,304	9,378	243,451	2,049	0.595	41.2	6,596,622	26.1	15.4	10.7	
South Western ...	1960-61	448,321	3,647,199	2,322	8,627	172,678	905	0.636	48.3	4,558,482	24.4	18.6	5.8	
	1959-60	879,009	3,261,916	2,052	7,836	162,761	853	0.623	46.4	4,728,630	24.6	15.8	8.8	
Eastern ...	1960-61	3,484,202	9,470,597	2,598	11,099	155,147	2,540	0.616	44.8	9,873,156	24.6	19.8	4.8	
	1959-60	3,866,373	8,376,506	2,290	9,770	146,816	2,439	0.614	41.8	11,409,132	24.6	15.5	9.1	
East Midlands ...	1960-61	1,165,985	7,940,523	2,011	9,707	315,914	2,026	0.539	46.6	2,959,803	23.2	17.4	5.8	
	1959-60	1,528,136	7,084,760	1,761	8,429	298,530	1,883	0.515	45.5	3,090,018	23.5	14.0	9.5	
Midlands ...	1960-61	1,673,362	10,445,431	2,401	10,093	285,298	2,649	0.588	46.8	8,111,379	25.2	20.8	4.4	
	1959-60	2,808,932	9,382,674	2,071	8,977	268,233	2,455	0.562	45.9	9,115,627	24.7	15.8	8.9	
South Wales ...	1960-61	54,415	5,825,573	1,875	6,997	745,907	1,089	0.578	62.1	2,444,072	23.2	21.0	2.2	
	1959-60	555,172	5,330,486	1,644	6,191	724,022	996	0.533	62.6	2,824,152	23.8	17.7	6.1	
M. & N. Wales ...	1960-61	981,854	6,173,017	2,139	9,578	361,008	1,389	0.571	52.5	3,941,923	23.2	17.6	5.6	
	1959-60	1,426,733	5,556,107	1,886	8,631	337,891	1,258	0.557	52.6	4,293,699	23.6	14.0	9.6	
Yorkshire ...	1960-61	(-)	405,535	10,504,944	2,020	8,886	365,061	2,538	0.505	49.5	4,436,747	23.6	16.8	6.8
	1959-60	1,944,494	9,267,082	1,666	7,742	337,965	2,239	0.468	49.6	4,853,295	23.8	14.1	9.7	
North Eastern ...	1960-61	1,862,265	5,773,525	1,702	7,726	346,222	1,265	0.535	53.9	2,773,282	21.8	14.0	7.8	
	1959-60	1,318,850	5,180,758	1,460	6,887	370,860	1,156	0.544	53.7	3,027,020	22.1	10.1	12.0	
North Western ...	1960-61	432,733	10,201,574	2,092	8,874	287,903	2,545	0.588	47.9	6,550,637	23.9	17.8	6.1	
	1959-60	1,630,495	9,081,216	1,830	7,980	261,295	2,360	0.562	46.4	7,582,982	23.6	14.4	9.2	

of continuity and reliability. The Eastern Board carried out tests in a random selection of consumers' houses during 26 weeks last winter to discover the extent and duration of abnormal supply voltages. The data obtained will be used to direct capital expenditure to the localities of greatest need.

The value of consumer research was further shown by an investigation by this Board to determine the characteristics of the domestic use of electricity. By means of printometers in 50 selected substations supplying about 20,000 domestic consumers a useful sample was obtained

#### DISTRIBUTION OF NATIONAL INDUSTRIAL SALES

Area Board	1959-61 per cent	1960-61 per cent
London ...	5.54	4.73
South Eastern ...	2.96	3.93
Southern ...	4.36	6.68
South Western ...	1.98	2.70
Eastern ...	6.73	7.68
East Midlands ...	9.13	9.43
Midlands ...	14.25	13.41
South Wales ...	9.78	9.49
Yorkshire ...	13.97	14.20
North Eastern ...	9.57	7.45
North Western ...	13.78	12.50
TOTALS ...	100.00	100.00

of the consumption by these consumers between 5 and 5.30 p.m. when the maximum demand occurs. The results showed that at the time of peak demand the average domestic load (after allowing for diversity) was 0.67 kW rising to about 0.7 kW at 7 p.m. Another important conclusion was that the average domestic load factor at the peak was about 39 per cent or less than the overall load factor. A significant feature of the after-diversity demand of domestic consumers established by this test was that within reasonable limits this demand is directly proportional to unit consumption. This knowledge was a major influence in determining new tariffs coming into force this month.

To increase the operational efficiency of their systems several Boards have put in hand schemes to extend remote control of outlying major substations and there has also been a considerable increase in the use of high-speed automatic reclosure and the extended use of mobile radio

equipment to assist in the rapid restoration of supplies, though the Eastern Board complains that the greater use of v.h.f. radio is seriously handicapped by the inability of the Post Office to allocate adequate frequency channels.

At Bournemouth the Southern Board is carrying out trials with a novel form of underground transformer chamber constructed from sections of 7ft diameter concrete pipe. A 132 kV wood pole line is being built from Salisbury to Shaftesbury and 13 schemes employing single-wire earth-return systems have been energised in connection with the national research programme. The South Western Board's two 3 MW gas turbo-generators operated satisfactorily with no more than normal maintenance, and the Board continued experiments with various types of underground low-voltage plastics cable.

A considerable measure of success was obtained from an experimental transductor installation commissioned by the Yorkshire Board. It consists of three variable shunt reactors designed to operate in conjunction with a 500 kVA arc furnace so as to maintain approximately constant the reactive power on the system and reduce voltage fluctuation.

The London Board continued experiments to find or design a satisfactory cold compression joint on aluminium conductors. A self-setting compound for filling joints used experimentally in four districts has shown promising results. A standard assembly designed by the North Western Board for domestic premises, which enables the meter, with its clear cyclometer dials, to be read from outside the house, accommodates all the Board's service and meter equipment and the consumer's main switch and fuse board.

#### Industrial Heating Exhibition

An exhibition of industrial heating by electricity is being held in the Industrial Demonstration Centre at the North Western Electricity Board's Polygon Depot, Tower Street, Ardwick, Manchester, from 4th to 13th October, daily (Saturday excepted) from 10 a.m. to 5 p.m., showing the wide application of electricity to the heat treatment of metals in the engineering industry. Demonstrations are being staged, at operating temperatures, of stress relieving, annealing and hardening, amongst other processes.



## DENMARK'S RELIANCE ON FOREIGN TRADE

Despite the small size of the home market and the absence of indigenous raw materials and sources of energy, Denmark's electrical industry has been expanding rapidly

Assembly shop for high voltage apparatus in the works of Laur. Knudsen Electrical Manufacturing Co., Ltd., Copenhagen

By KAI LUND\*

LIKE most other Western European countries, Denmark has had to face the problem of finding employment for a steadily increasing population. Here, as elsewhere, the answer has been industrialisation but, unlike most other countries, Denmark lacks one of the principal prerequisites for developing an industrial society—that of basic raw materials. In these circumstances it was only natural that industrial expansion should have been concentrated mainly on processing industries where skilled labour and a high technological and scientific standard are decisive factors in the struggle for competitiveness. The electrical manufacturing industry is a good example of this.

The electrification of Denmark started on a small scale about 1880 and stimulated the local manufacture of machinery and equipment for the generating stations. At first, electricity was used only for lighting, but at the turn of the century its use as a source of power gained ground, and ever since there has been an intimate interplay between production of equipment and consumption of electric power. While electrification was a necessary condition for the establishment and growth of an electrical manufacturing industry, the industry itself, through research and technical development, has provided the basis for a constantly-increasing consumption of electricity.

The Danish home market has always been the basis

of the Danish electrical manufacturing industry which sets itself the task of meeting as far as possible the rising local demand for electrical goods. As a consequence, the industry today supplies a substantial part of Denmark's requirements for a wide variety of electrical products, including machinery and equipment for power stations and high-voltage systems, electric motors, dry batteries, incandescent lamps, radio and television transmitters, receivers and components, telephone and telegraph equipment, domestic appliances, cables and wires, insulators, installation material, welding equipment and instruments. In addition, the Danish electrical industry has developed specialities in various fields, for example, electrically-driven ships' machinery, such as cargo winches, capstans and steering gear.

### Post-War Growth

It is generally accepted that one of the main characteristics of an expanding economy is a continuous increase in the *per capita* consumption of electricity; Denmark is no exception to this rule. At the turn of the century, electricity consumption in Denmark amounted to about one million kWh annually. By 1946 it had grown to 1,000 million kWh and consumption doubled during the following four years. In 1959 it was about four times the 1946 figure, and the sharp upward trend shows no sign of abating.

The production of electrical machinery and equipment has shown a similar expansion. From 391 million kroner† in 1949 it rose to 1,249 million kroner in 1959, an increase of about 319 per cent (Table 1). This compares with a rise in total Danish industrial production of only 240 per cent during the same period. In 1959 the output of the electrical manufacturing industry accounted for 7 per

TABLE I.—ELECTRICAL PRODUCTION IN DENMARK

	1949 Million kroner	1959
Electrical Machinery (Generators, transformers, motors, lifting and loading machinery, electro-mechanical domestic appliances) ... ... ... ...	92	270
Cables and Wires ... ... ... ...	70	154
Radio and TV Equipment, Components and Accessories ... ... ... ...	68	385
Other Electrical Goods ... ... ... ...	161	440
Total ... ... ... ...	391	1,249

\* Federation of Danish Industries. † £1 = 19.4 kroner.

TABLE 2.—DANISH ELECTRICAL EXPORTS

	1949 Million kroner	1959
Electrical Machinery (Generators, transformers, motors, etc.)...	6	49
Other Electrical and Allied Machinery (Lifting and loading machinery, welding machines, etc.)	9	52
Domestic Appliances (Refrigerators, vacuum cleaners, mixers, cookers, heaters, etc.)	3	26
Radio and Telecommunication Equipment (Radio and TV transmitters and receivers, parts and components, telephone and telegraph equipment, etc.)	10	41
Other Electrical Goods	53	166
Total	81	334

Assembly line for small motors in the works of Thomas B. Thrige, Odense

cent of Denmark's total industrial production. The number of employees of all types in the electrical industry in 1959 was about 33,000 or about 9 per cent of the total labour force.

During the post-war period technical development opened up numerous new fields of activity to the electrical manufacturing industry and enabled it to make a valuable contribution to the productive efficiency of industry as a whole. At the same time the rising standard of living created a ready market for durable consumer goods, and this resulted in a change in the relative importance of different groups of products. The advance in mechanisation and automation provided the background for a substantial expansion in the production of automatic controls and electronic equipment, and the demand for consumer goods gave impetus to the production of refrigerators,

cookers and other domestic appliances. The ability of the industry to adapt itself to meet a sudden demand for special products is perhaps best illustrated by the achievements of the manufacturers of television receivers. In the early 'fifties, television in Denmark was still at the experimental stage, and there was only a limited production of television sets. Thus, in 1954, total production amounted to about 2,400 sets, but only one year later 10,000 sets were produced. In 1959 a total of 161,000 sets was reached, and the rate of expansion does not show any sign of falling off.

#### Overseas Trade

A flourishing export trade is vital to Denmark because of the almost complete absence of raw materials and natural sources of energy and the electrical industry makes a valuable contribution to the country's export drive. In 1959, Danish electrical exports totalled 334 million kroner, which was about four times the 1949 figure (Table 2), and represented 27 per cent of the electrical industry's total production as compared with 21 per cent in 1949. This ratio of exports to total production has risen in spite of the fact that production for the home market has trebled over the same period. Danish electrical goods find markets



10 kV, 1,940 h.p. pump motors in Asnæsværket power station, Kalundborg (Titan, Ltd., Copenhagen)

TABLE 3.—DANISH ELECTRICAL IMPORTS

	1949 Million kroner	1959
Electrical and Allied Machinery, Parts and Accessories	27	100
Domestic Appliances, Parts and Accessories...	2	15
Radio and Telecommunication Equipment (Radio and TV parts and components, radio, TV, and other electronic valves; transistors, telephone and telegraph equipment, radar, etc.)	14	130
Other Electrical Goods...	53	158
Total ...	96	403

in some 70 territories throughout the world. The distribution in broad categories is as follows:—30 per cent to the European Free Trade Area countries, 23 per cent to the Common Market countries, and 47 per cent to other countries.

Danish electrical exports are made up of a wide range of products, among which may be mentioned generators and motors, dry batteries, vacuum cleaners, refrigerators, loudspeakers, capacitors, resistors, electronic measuring instruments, radio and television sets, marine radio equipment, electro-medical equipment, sound recording equipment, tape recorders, automatic controls, switches, voltage regulators, X-ray units, control panels, cables and wires, insulators, cargo winches and capstans.

Another aspect of an expanding economy is a corresponding rise in imported raw materials, semi-manu-

factures, and capital equipment. Imports of electrical machinery and equipment into Denmark totalled 403 million kroner in 1959, which was about four times the 1949 figure (Table 3).

### European Co-operation

The scope for industrial expansion in a country with a home market of only four million inhabitants must of necessity be limited at a time when mass production is the key to competitiveness. This was one of the motives for Denmark joining the E.F.T.A., and explains Danish interest in the endeavours to bridge the gap between the E.F.T.A. and the E.E.C.\* From a Danish point of view, the ultimate goal must be an integrated Europe comprising all the former O.E.E.C. countries. As we see it in Denmark, the question of European integration is at present primarily a political issue, and at this stage there is scarcely anything the electrical industries of Europe can do to influence the decision to be taken. There is, however, scope for European co-operation in other fields, for example, in standardisation and appliance testing, and there is every reason to welcome the recently-established collaboration between the electrical standardisation organisations of the E.E.C. and the E.F.T.A. countries.

\* Since this article was written Denmark, like Britain, has applied for membership of the Common Market.—Editors, *Electrical Review*.

### NEW LEEDS SUBSTATION

THE official opening of the Clarence Road, Leeds, 33/11 kV substation took place on 21st September.

The substation has been designed to give a firm capacity of 18.75 MVA with a short-time rating of 23 MVA. Transformation is from 33 to 11 kV, the existing 6.6 kV secondary distribution cables being uprated to work at 11 kV. Experiments have shown the cables to be capable of working at the higher voltage provided the cable joints and boxes are remade to modern 11 kV designs. Existing secondary substations have been re-equipped with 11 kV transformers and switchgear.

The supply is obtained from the Low Road grid supply point by two 33 kV, 0.4 sq in cables of the oil-filled ductless type, connected directly to the busbars of two switchboards each having two circuit-breakers. One of these controls the new substation transformers and the other the feeder to another new substation at Burmantofts.

Two 18.75 MVA, 33/11 kV transformers at the rear of the building are of the outdoor oil-cooled type. Oil-circulating pumps, automatically controlled by temperature-sensitive devices, are included and permit an emergency overload of 23 MVA. Two 11,000/415 V auxiliary transformers are connected directly to the 11 kV terminals of the main transformers and provide the 415/240 V supplies required for the substation.

The 33 kV switchgear is of the vertical isolation type with a current rating of 800 A and a short-circuit making and breaking capacity of

13,100 A, equivalent to 750 MVA. A 13-panel single busbar switchboard is provided to control the 11 kV outgoing feeders and the 33 to 11 kV transformers. The compound-insulated busbars are in two sections connected by a bus-section switch. The oil circuit-breakers have a proved short-circuit making and breaking capacity equivalent to 250 MVA.

The switchgear is operated from a control room in the substation, or by using remote control and indication equipment operated over the Board's telephone cables by the control engineer at the Low Road control centre. Street lighting, supplied from the substation, is controlled automatically on receipt of a signal from the Street Lighting Department, Springwell Street, Leeds, using a h.f. signal.

The switchgear was supplied by A. Reyrolle & Co., Ltd., the transformers by the Yorkshire Electric Transformer Co., Ltd., and the cables by Pirelli-General Cable Works, Ltd.



New two-storey substation at Clarence Road, Leeds

# Electrical Machinery Theory

A TWO-DAY conference on the teaching of electrical machinery theory was held in the Department of Electrical Engineering at Queen Mary College (University of London) on Thursday and Friday of last week. The conference was attended by over 80 participants, representing most universities and large colleges of technology in the United Kingdom and Eire. There were also a number of representatives from industry.

For many years this subject has been taught by traditional methods, each type of machine being considered in turn, starting with the transformer and proceeding through d.c., induction and synchronous machines. Special machines, such as the Schrage motor, were dealt with later if time permitted. This approach covered steady-state working only and transient operation was dealt with later and only to a limited extent, again if time permitted.

During the last few years there has been a new approach to the subject of electro-mechanical energy conversion. This stems from the original writings of Gabriel Kron, who suggested over 25 years ago that all electrical machines are specialised applications of a completely general machine. This approach deals with each individual machine type as a special case of the general machine and considers steady-state operation as a special case of transient operation. A full understanding of the transient operation of machines has now become very important, particularly in regard to machines as elements in control systems.

Some earlier attempts to present the new approach have tended to be highly mathematical, and have therefore been given only to students specialising in electrical power after an earlier course of lectures following the conventional pattern. The lectures of the present conference have shown that it is possible to adopt a very general approach initially.

The lectures of Prof. M. G. Say (Heriot-Watt College) and Dr. B. Adkins (Imperial College) showed how this could be done. An appropriate laboratory course—an essential accompaniment to a lecture course of the new kind—was outlined by Mr. A. J. Ellison (Queen Mary College), who also demonstrated a new generalised electrical machine set made by A.E.I. (Rugby), Ltd., for teaching purposes. The generalised machine has 32 stator slots carrying a four-pole, two-phase winding arranged in sections for connection as required in series, series-parallel or parallel. The rotor has two separate windings in 24 slots: one is a three-phase lap winding suitable for mains voltage, and the other a wave-wound commutator winding, with one dead coil, connected to a 95-segment commutator. The second winding has four tappings at  $90^\circ$  electrically and three tappings at  $120^\circ$ , giving six, one being common. Five search wires are included in the stator, arranged from end to end of slots 1, 2, 8, 9 and 10, and therefore the effect of various pitches can be studied, a full-pitch stator coil occupying slots 1-8. A search wire connected between one slip-ring and earth is included in a rotor slot.

There are two sets of commutator brush gear, each

carrying effectively four brushes  $90^\circ$  electrically apart. One set is connected to flexible leads and can be adjusted round the commutator over an arc of  $180^\circ$ . The other set is connected via slip-rings and is continuously rotatable, being then driven by a small shunt motor at speeds up to about 500 rev/min.

Connections to the other slip-rings are made through movable links, which are adjusted in position to select the rotor winding required: either the three ends of the three-phase winding; the four tappings on the commutator winding at  $90^\circ$  electrically; or the three tappings on the latter at  $120^\circ$ .

The commutator brush gear is arranged in halves for the operation of the machine as a Schrage motor. When one of the halves is being continuously rotated the other is out of use with the brushes lifted. The two sets of commutator brushes can be locked at any position, scales being provided to indicate the angular position and the angular separation.

The machine is coupled to a d.c. shunt machine to drive and load it. The coupling is arranged to measure instantaneous torque by using the magnetostriction effect in a steel tube under torsion. Electrical tachometers are arranged to give the instantaneous speeds of the rotor and of the rotating brush gear. The rotor tachometer is a four-pole a.c. generator which enables transient load angles to be studied when the machine is running as a synchronous machine. A neon lamp is provided adjacent to one coupling to allow steady-state load angles to be observed. The set was controlled through a panel made by the college, to whose specification the set was designed.

Lectures covering some of the more advanced aspects of the subject of the conference were given by Mr. J. G. Henderson (University of Birmingham) and by Drs. C. V. Jones and J. W. Lynn (University of Liverpool). Auxiliary problems of practical importance were discussed in the paper presented by Dr. A. J. O. Cruickshank (University of St. Andrews) and the views of industry were given by Mr. J. F. Levy and Mr. D. D. Stephen (A.E.I. (Rugby), Ltd.). A paper by Dr. G. S. Brosan (Education Committee, Middlesex County Council) dealt with the subject of energy conversion.

## NON-DESTRUCTIVE TESTING

The fourth International Conference on Non-Destructive Testing is to be held in London from 9th to 13th September, 1963. The Institution of Mechanical Engineers will arrange the conference, which is sponsored by the British National Committee for Non-Destructive Testing. Its scope will include all aspects of the subject and the tentative sections are as follows: (1) basic physics and selection of method; (2) non-destructive testing in general structures including power plants, etc.; (3) non-destructive testing in transport including ships, etc.; and (4) future trends in non-destructive testing. Prospective authors are invited to write to the secretary of the Institution of Mechanical Engineers and further details can also be obtained from the Institution at 1, Birdcage Walk, Westminster, London, S.W.1.

# Electrical Engineers Exhibition

## Possible Changes to Meet New Conditions

SOMETHING like 800 people attended the second annual dinner organised by the Electrical Engineers (A.S.E.E.) Exhibition, Ltd., at Grosvenor House, London, W.1, on Thursday last week. They represented all branches of the electrical and allied industries, Government Departments and overseas diplomatic services. Mr. R. F. Mathieson, Associate I.E.E., chairman of the company, presided.

The first toast, "The Electrical Industry," was proposed by Air Marshal Sir Herbert Spreckley, Controller of Engineering and Equipment, Air Ministry, who contrasted the "electrics" in the aircraft of 37 years ago, when he joined the R.A.F., with the elaborate equipment now employed. He emphasised the vital importance of reliability and said that this presented a great challenge to the electrical industry whose international prestige depended on it.

### The Common Market

In responding to the toast, Sir Charles Westlake, chairman of Metal Industries, Ltd., said that most of his life had been spent in electricity supply: he had found during his five years in the manufacturing industry that conditions were much "tougher" there. He went on to say that as a believer in the Commonwealth he was sentimentally opposed to Britain's entry into the European Common Market, but as a business man he realised the necessity for it. By joining the community we could have a market of 200 million people, although it was true that they might have enough productive capacity to meet their own needs.

While in the electricity supply business he had spent about £30 million on British electrical equipment and he had never been let down. He thought, however, that British manufacturers should make their products *look* as good as they were, to make selling easier. He deprecated the breaking up of price agreements which, with safeguards, ensured a reasonable return for producers, enabling them to find funds for research and development. He urged manufacturers to keep their delivery promises. Continental competitors were often more particular about this and they were often able to quote lower prices. Nevertheless, he had no doubt that British industry would once again rise to the occasion if Britain entered the Common Market.

The toast of "The 1962 Exhibition" was proposed by Sir William McFadzean, chairman and managing director of British Insulated Callender's Cables, Ltd., and chairman of the Export Council of Europe. In the latter capacity he dealt with some aspects of export trade, particularly as it concerned Europe. He said that in addition to producing goods at the right price and at the right time it was necessary to sell them and in this exhibitions could play a vital part. There was no better way of supporting propaganda and salesmanship than a really well-staged display of first-class products.

Sir William said that this highlighted the inadequacy

of exhibition facilities in London which made it difficult to present exhibitions to the high standards required and also made it more difficult to "internationalise" them. An F.B.I. group had been going into that matter and he believed that it would submit a report before the end of the year. He was delighted that there had been a trend towards opening our exhibitions to foreign exhibitors. None of them should be afraid of having their products compared with those of their international competitors. If there were any fears, they had better be lost if we hoped to survive in the face of reductions of tariff barriers and restrictions.

He realised that there were many trade fairs and exhibitions and participation was costly. One must be selective and must be prepared to put on a good show; otherwise it was better to stay out. He commended the Electrical Engineers Exhibition and was confident that it would go from strength to strength.

In the course of his reply Mr. Mathieson said that most of the sponsors' publicity effort had been devoted to telling potential overseas buyers about the exhibition and about the arrangements made for the convenience and comfort of visitors. This year's attendance of 76,000 included 800 visitors from 88 countries. The organisers could claim that every visitor was there with a purpose and that all inquiries were of value.

They were sure that the 1962 exhibition would be a colourful and exciting display. The first-floor feature would be "Electricity in Aviation." The electrical engineer played an important part in equipment on board aircraft and on the ground too. The organisers were ready to meet changes in industry, in economic policy and in the nature of exhibitions generally. They could not ignore the present trend towards integration with Europe. Many of our manufacturers were considering the possibility of setting up production units in Europe and they might wish to show at the exhibition goods produced abroad. Thus, the organisers might have to re-examine the restriction of exhibits to goods produced in the United Kingdom but in this, and in other matters, no decisions would be made until they were satisfied that they were in the best interests of all concerned.

### CARBON FILM RESISTORS

TWO reports dealing with carbon film resistors have been produced by the Electrical Research Association and circulated to members. These, now generally available, are report Ref. Z/T105, "The Performance of Insulated Carbon-Resin Film Resistors II," by F. G. Rivers, and report Ref. Z/T124, "High Stability Carbon-Film Fixed Resistors. D.c. Failure in Moist Atmospheres," by I. D. L. Ball and R. G. J. Butler. These reports are available, priced 10s. 6d and 7s 6d respectively, from the Association at Cleeve Road, Leatherhead, Surrey.

## LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication.  
Responsibility cannot be accepted for the opinions expressed by correspondents

### "Mixed" Socket-Outlets

I AM wondering if Mr. Brealey (*Electrical Review*, 22nd September) would protest if a British Standard Specification for hats restricted size to 6 $\frac{1}{2}$  in only.

I have recently purchased a small three-bedroomed house, one of the 300,000 being built each year, or so they say. My builder friend or his accomplice was proud to instruct me on the electrical marvels of the new house, possessing eight of the very latest 13 A flat pin socket-outlets, and I could have, he told me, additional outlets at £3 10s each as an extra. Now being a layman and realising also that a little knowledge is dangerous, I held my tongue with a view to making some inquiries. The first thing I discovered was that the very latest 13 A sockets being offered were in use some 13 years ago.

My previous old house, built in the bad old days to which Mr. Brealey refers, when beer was three pots a shilling and possessed just enough nuclear power to cause a rosy hue (no more), was wired with sockets of all shapes and sizes—20 or more of them but still not enough for today's needs and I admit occasioned some inconvenience at times due to their variety. But the thought of paying my builder friend £3 10s each for another 12 socket-outlets, £42, made me sit up.

Fortunately for me I must have seen the same publication as Mr. Brealey which advertised a single unit comprising one 13 A outlet and two 2 A outlets. I had ten of these units put into the new house: kitchen—two, dining room—two, lounge—two, hall—one, and one in each bedroom, giving me a total of 30 outlets for an additional cost of £12 10s or an extra 22 outlets installed for that price and complete interchangeability observed.

My builder friend seems to think I have cheated him in some way, but I do hope that what I have done will not offend Mr. Brealey, and if so, perhaps he would be good enough to comment.

Knowle, Warwickshire.

HORACE G. EVERITT.

### Automatic Control in the Home

OF course "Reflector" didn't really mean it when he said: "... the time switch is one of the most useful if not the only form of automatic control which can be introduced into the home."

With four thermostats controlling electrical tubular background heating, two thermostats on convectors, one on an oven, two in water heaters, etc., and no time switch at all, I feel I must put in a plea for the domestic automatic controls afforded by thermostats (particularly as I have no connection with their manufacture or sale).

Except for off-peak heating or maximum demand meter control, I see a negligible field for domestic time switches when compared with thermostats. For the most part, time-switch control of heating devices is a subscription to an Englishman's inborn meanness in his attitude to central heating: either he won't pay for background heating, or he, foolishly, considers it a waste of money to

have it on during short-term absences from the house.

With background heating controlled by thermostats and "topped-up" by radiant or convector heaters there is negligible use for time-controlled devices. The year round, the thermostat setting need only be altered if it is required to give a general boost to the temperature of a room which you know will be occupied in an hour or so. For immediate use the "topping-up" radiator or convector is employed.

There remain, of course, time switches for domestic lighting, but in the majority of cases the convenience or protection afforded by their use does not justify the capital cost of purchase and installation.

Bramhall, Ches.

F. ROSTRON.

### The Citrine Lecture

LIKE you I applaud the decision of the British Electrical Power Convention Council in instituting a "Citrine Lecture" to be given at each future Convention. It is a well-deserved recognition of the sincere and constant support given by Lord Citrine throughout the years. Perhaps I alone know of the difficulties which had to be encountered in endeavouring to secure sufficient support for the continuance of the I.M.E.A. Convention under the new regime. Thanks also are to be extended to the electricity authorities for their financial support.

My only comment is: why is the lecture to be given by an overseas author? Surely we have an abundance of talent in this country, inside and outside of the electrical industry. Why not offer a prize, each year, for this lecture?

Sanderstead, Surrey.

JOHN W. SIMPSON.

[Mr. Simpson was secretary of the British Electrical Power Convention until 1959.—Editors, *Electrical Review*.]

### A.S.E.E. DIPLOMA

AT the 15th annual examinations for the A.S.E.E. diploma held last May 50 per cent of the entrants successfully completed the examination. Mr. K. S. G. Hopper, who is on the teaching staff of Caernarvonshire Technical College, Bangor, passed the examination with honours; only twice before has a candidate obtained this distinction.

The individual results achieved by candidates have been reviewed by the Association's Executive Council and the first premium of 25 guineas has been awarded to Mr. Hopper. A premium of 15 guineas has been awarded to Mr. A. Driver, of Crewe, and one for 5 guineas to Mr. S. Austin, of Whitstable, Kent. These awards are donated by the Electrical Engineers (A.S.E.E.) Exhibition, Ltd. Further premium awards will be made by the Association when the City and Guilds of London Institute publish the results of the electrical technicians' course examination.

The Regulations and Syllabuses of the A.S.E.E. diploma scheme have now been revised and the new conditions will apply to examinations held in future years. Copies are available from the General Secretary, A.S.E.E., 23, Bloomsbury Square, London, W.C.1.

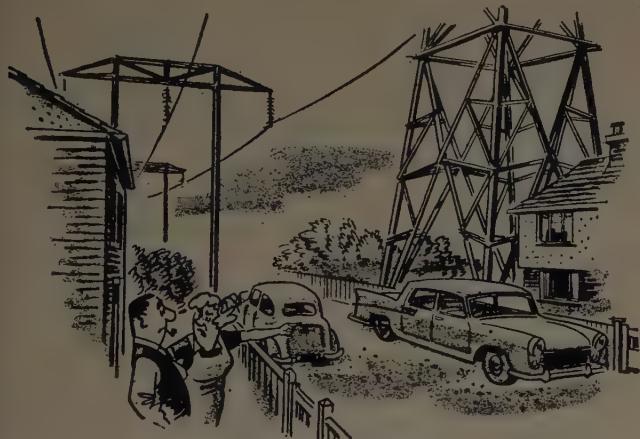
# VIEWS on the NEWS

By "REFLECTOR"

QUITE a long time ago I made some adverse comments on the continuation of the archaic custom of requiring new electricity consumers to put down a deposit, as a safeguard against the non-payment of accounts. I can hardly claim the credit for it, but it is a fact that those Electricity Boards which were still asking for deposits have dropped the practice over the years, although there may still be some exceptions. It seems as though the North Western Board has been forced by the increasing number of bad debts to ask new tenants in "bad reputation" areas (I quote from the *Manchester Evening News*) to pay an initial £5 deposit or have their supply disconnected. Occupiers of furnished flats are said to be the "top target," but among other classes are "proprietors of strip-tease clubs and car parks." I am pleased to note that anyone giving proof of his standing and reliability is not asked for a deposit.

\* \* \* \*

I reproduce with the kind permission of the editor of *Power News* (the newspaper of the Central Electricity



"And they've got a bigger tower!"

Generating Board) the drawing which won the first prize in the journal's latest monthly competition. It is by Mr. A. Adams who is at the Gravesend (Kent) power station.

\* \* \* \*

It is on (perhaps doubtful) record that a surfeit of lampreys proved fatal to a British monarch. A report from the Ottawa correspondent of *The Times* says that a surfeit of lampreys in the Great Lakes is causing (in another sense) a great deal of mortality among the lake trout and white fish there. These eel-like creatures fasten on to their victims and suck them dry. Attempts to destroy

them electrically are said to have been not altogether successful and I am not surprised when I read of the methods adopted. These take the form of electrical "barriers" consisting of a series of electrodes to create an electrical field which, apparently, is lethal not only to the lampreys but to the fish as well, to say nothing of human beings. By reason of their vastly greater numbers the lampreys seem to have come off best.

\* \* \* \*

Readers should welcome any tip which promises better performance from their electrical appliances. Here is one from the *Middlesex Advertiser and County Gazette*:

"The next time you light the oven (gas or electric), leave the oven door open for about five minutes. This will stop condensation and, more important, keep the oven from rusting. Believe it or not, it also makes the oven heat up faster!"

Gas or electric?

\* \* \* \*

Much is made in the reports of the Electricity Boards of the progress of rural electrification. It may be news to many that the subject came up at the British Association meeting 80 years ago. There was a paper by Dr. C. W. (later Sir Charles) Siemens in which he described some work carried out on his own estate. Much of it was concerned with the forcing of fruit and vegetables by electric light, but the author went on to deal with the improvement of the load factor by using the generating equipment during the day for providing power for "such operations as chaff cutting, swede slicing, timber sawing and water pumping." He went on:

"These objects are accomplished by means of small dynamo machines, placed at the points where power is required for these various purposes, and which are in metallic connection with the current-generating dynamo-machine near the engine. The connecting wires employed consist each of a naked strand of copper wire, supported on wooden poles, or on trees, without the use of insulators, while the return circuit is effected through the park railing or wire fencing of the place, which is connected with both transmitting and working machines, by means of short pieces of connecting wire. In order to insure the metallic continuity of the wire fencing, care has to be taken wherever there are gates to solder a piece of wire buried below the gate to the wire fencing on either side."

The voltage of this rather elementary distribution system was not stated. Dr. Siemens visualised the eventual application of electric power to threshing, reaping and ploughing.

## New Books

### Toughness and Brittleness in Metals. Pp. 108; figs.

Published for the Institution of Metallurgists by Iliffe Books, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 27s 6d.

Every year since 1947 the Institution of Metallurgists has held a refresher course for its members, during which four leading authorities survey the present state of knowledge in relation to some particular aspect of metallurgy. The present volume, the fifth in a series, presents the papers read at the 1960 course reviewing toughness and brittleness in metals.

In the first paper, by Professor N. J. Petch, the differences between tough and brittle fractures and the mechanisms of crack formation are discussed. G. M. Boyd, in the second paper, discusses the engineering aspect of stable and unstable types of fracture, explains cleavage and shear fracture, and illustrates these with classical cases. In the third paper, E. A. G. Liddiard describes the effect of environment on embrittlement, delayed fracture, the effects of various coatings, and of corrosion products and corrosion fatigue. Finally, H. M. Finniston gives the approach of the metallurgist to the problem of ductility and brittleness and discusses the effect of strain rate, work hardening, irradiation, multi-phase alloys, heat-treatable alloys and precipitation-hardening alloys.

**The Plasma State.** By E. J. Hellund. Pp. 197; figs. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 52s.

This book is for the engineer or research worker who would like to learn something about highly ionised plasmas and their potentialities without having first to acquire a specialist knowledge. The text is essentially non-mathematical, the fundamental concepts underlying plasma behaviour being presented with the aid of models which will be appreciated readily by anyone with a sound electrical engineering background. The author has endeavoured to give an integrated account of the plasma state relating cosmological phenomena on a scale with terrestrial applications in a logical train of thought. The greatest benefit is therefore obtained if the book can be read straight through. For those who would know more, three books are suggested for further reading, the last of which is to be noted for its own extensive bibliography.

As a result of the author's connections with the Plasma-dyne Corporation, the accent has been placed on the newer aspects of plasma application. One chapter gives a good imaginative account of plasma chemistry. Another summarises the current thermonuclear position. Finally, refractory spraying, direct conversion, and space flight applications of plasma are discussed. In each of these a critical assessment has been made, the obstacles encountered in contemporary research problems being faithfully represented.

In order to condense his work into less than 200 pages, the author has employed the simplest possible models of plasma behaviour. His treatment of the more complex phenomena—such as the arc cathode mechanism—tends,

as a result perhaps, to degenerate into a list of exceptions which may divert the newcomer from the essential continuity underlying the general exposition. The diagrams and illustrations chosen are not consistent with the otherwise high standard of presentation, and there are surprisingly few of them for a book of this kind.—J.J.M.

**The Mathematical Theory of Linear Systems.** By B. M. Brown, M.A. Pp. 267; figs. Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 50s.

This book belongs to the publishers' series on automation and control engineering. It is thus primarily for control engineers and is devoted to the presentation of principles rather than to applications. On a broad assessment, however, the book is of value to most engineering students since linear systems are one of the engineer's main concerns. This is emphasised by the fact that the general theory is based upon the fundamental properties of linear differential equations, operational notation and methods being used when deemed appropriate.

The book opens with a chapter on linear differential equations with constant coefficients, followed by a discussion of solutions by operational methods and solutions with given initial conditions introducing the unilateral Laplace transform. Fourier series and integrals and Fourier and Laplace transforms are next covered, followed by a chapter on step and impulse functions. Four chapters on linear systems are then given, including their definitions, general properties and analysis, stability conditions and criteria, and feedback characteristics.

Statistical methods and the design of optimum systems are next discussed, being followed by chapters on difference operators and the general linear operator. The last two chapters are on sampling systems and interpolation systems. Thirteen appendices are given on miscellaneous topics relevant to the essential text. Worked examples and exercises with answers are provided which serve to keep the reader on an even keel.

The standard of the work is that of elementary to intermediate and it does not assume an unduly high prior knowledge of the techniques presented. For research workers, to whom mathematics are essential, for the mathematically-inclined engineer and for engineering students, this book will be found to be a help, by reason of both its contents and treatment. It deserves and should attain considerable popularity.—A.E.

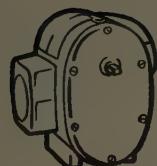
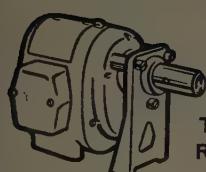
### Mechanical Handling Film

A documentary film, "Mechanical Handling at Your Service," has been produced for the Mechanical Handling Engineers' Association to illustrate the role played by mechanical handling equipment in the efficient and economic production of goods by various sections of industry. The 16 mm sound colour film has a running time of approximately 45 min and is available on loan upon application to the Association at 94/98, Petty France, London, S.W.1.



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# Unity in the Electrical Industry

I.E.E. PRESIDENTIAL ADDRESS

BY MR. G. S. C. LUCAS,  
O.B.E., F.C.G.I.



WHEN Mr. G. S. C. Lucas delivered his inaugural address as President of the Institution of Electrical Engineers in London last night he surveyed the growth and deployment of manpower in the electrical industry. He said that in proportion to our total population we had a good body of well-educated and well-trained electrical engineers and electrical technicians. To maintain and build up this body to support the growing industry we must continue to recruit and to train. We also had a large number of technicians serving the industry at all levels between the craftsman and the professional engineer. The number of men in this category was increasing rapidly and they merited the help and support of the professional institutions.

The time had come when technicians' qualifications should be recognised as something honourable and worthwhile in their own right, and it was to be hoped that the existing confusion caused by using the National Certificate courses for meeting the educational requirements of professional bodies as well as for providing technician qualifications would not continue much longer.

The differences of total manpower between the United Kingdom and other countries did not alone explain the failure of this country to exploit quickly many of its new scientific discoveries and inventions, nor did these differences explain away the criticism so often levelled at Britain that her fundamental research and inventions were good but that the subsequent translation into marketable products was slow and poor. Mr. Lucas was of the opinion that the trouble lay not so much in our smaller total numbers, as in the fact that our technical manpower was too widely dispersed in units too small to compete with the larger industrial units abroad. Our technical resources were being dissipated in duplicating the development of the same apparatus and devices in separate research, development and design teams. Fortunately, however, there had been a marked trend in recent years (in some industries with Government intervention or at least persuasion) towards larger industrial units which could support industrial research and development effort more in keeping with the demands, and this was a trend that we must expect to grow in the future. We must encourage it to grow if we were to use our technical manpower efficiently.

The President then turned his attention to those

two great branches of the industry, "electronics" and "power." He said that these two fields of activity were not only becoming daily more dependent on one another, but the post-war developments in nuclear and solid-state physics were opening up new fields for the power engineer which were increasing the overlap and called for common basic curricula in our colleges and universities for the "electronics" and "power" engineers.

The rapid developments in "electronics" and "power" and the need to use these developments in other industries was emphasising the importance of the "application" engineer. He was not a designer of apparatus or of devices. He was a combination of "electronic" engineer and "power" engineer with a good knowledge of the principles of control and a specialised knowledge of the industry he served. It was not the same application engineer or group of application engineers who could solve with equal facility the systems problems of the steel mill, the power station, the manufacturing line, the aircraft or the ship. The principles underlying the application in each field were common principles, but the fields of application were specialist fields and the industrial application engineer was as much a specialist as the designers of turbo-alternators or computers. Mr. Lucas felt that this was a pattern which would become more clearly defined as time went by.

## Practical Training

In conclusion, the President turned to practical training for electrical engineers which, he said, had its origin in the large manufacturing companies of this country in the early 1920's, and modern training schemes for electrical engineers were framed largely on these early patterns. They had served the industry and the profession well and would continue to do so, but many today were asking whether the existing courses were suitable for those university graduates whose backgrounds and interests were more closely allied to the research workers who saw their life's work in the laboratory. We needed a new look at practical training schemes to make them more appropriate for the university graduates who would become the key technical and administrative personnel in the future, and it might well be that it would be possible to offer such schemes only to selected men who could benefit from this training.

# I.E.E. Section and Centre Chairmen

THIS week the Institution of Electrical Engineers opens its new session. A biography of the President, Mr. G. S. J. Lucas, O.B.E., F.C.G.I., M.I.E.E. (a summary of whose inaugural address appears on the previous page), was published in our issue of 14th July last, with the names and portraits of new vice-presidents and Council members. We now give brief notes of the careers of both the Section and Centre chairmen for the forthcoming session. Details of the Sub-Centre chairmen will be published in an early issue.

The new chairman of the Supply Section of the Institution of Electrical Engineers for the session commencing in October is Mr. J. S. Forrest, M.A., D.Sc., M.I.E.E., director of the Central Electricity Research Laboratories at Leatherhead. Dr. Forrest was appointed mathematical physicist to the former Central Electricity Board in 1930, working on problems arising in connection with the commissioning of the grid system. He made a special study of high-voltage power transmission and played an active part in the development of 132, 275 and 400 kV transmission. His D.Sc. degree was awarded for research on h.v. insulation. On the nationalisation of the industry he became director of the British Electricity Authority's Research Laboratories at Leatherhead and Croydon. He has served as secretary of the Electricity Supply Research Council and has written papers on insulation, lightning and electrical power transmission.

Mr. H. G. Taylor, D.Sc., F.Inst.P., M.I.E.E., chairman of the Utilisation Section, has been director of the Electrical Research Association since 1957. He received his training with Vickers, Ltd., and the Metropolitan-Vickers Electrical Co., Ltd., subsequently joining the scientific staff of the E.R.A. where he was engaged upon investigations concerned largely with problems of safety, earthing and earth currents in electrical systems. For his published

work in this field he received the D.Sc.(Eng.) degree of London University in 1940. From 1938 to 1943 he was electrical engineer to the Copper Development Association and then became manager of the Industrial Development Department of Philips Electrical, Ltd., where he was responsible for development work on electric welding. Before taking up his present position he was for ten years director of the British Welding Research Association.

Mr. W. S. Elliott, M.A., F.Inst.P., M.I.E.E., chairman of the Measurement and Control Section, is well known for his work on computers. He was educated at Peterborough and obtained an open exhibition to St. Catharine's College, Cambridge. During the war he was engaged on radar research and development with the Ministry of Supply and afterwards became chief physicist to the Powell Duffryn Research Laboratories. In 1947 he joined the research laboratories of Elliott Brothers (London), Ltd., where he established the Computer Division and from 1953 to 1956 he was with Ferranti, Ltd., as head of their London computer laboratories. In 1956 he joined the I.B.M. World Trade Organisation and established their British laboratories, where the team of scientists and engineers now numbers nearly 500. Until recently he was a director of the parent company and managing director of I.B.M. World Trade Laboratories (Great Britain), Ltd. Mr. Elliott has been responsible for the design of a number of computers and is the author or co-author of various papers on the subject. He is a member of the Court of Southampton University.

This year's chairman of the Electronics and Communications Section is Mr. R. J. Halsey, C.M.G., B.Sc. (Eng.), F.C.G.I., M.I.E.E., director of research, Post Office Engineering Department, and director, Cable & Wireless, Ltd. He entered the Post Office Engineering Department in

1927 and, until his appointment as assistant engineer-in-chief in 1953, was engaged on work at the Post Office Research Station connected with line transmission. He was in charge of the work which led to the laying of the first-ever repeatered submarine cable between Anglesey and the Isle of Man in 1943 and of a number of such cables around the British Isles. He also led the Post Office project team which collaborated with the American Telephone & Telegraph Co. in the overall planning and engineering of the first transatlantic telephone cable system, opened for service in 1956. Before completion of the Atlantic cable he was already organising the development of the new deep-sea cable to be used in the Anglo-Canadian telephone cable (CANTAT), and other sections of the Commonwealth round-the-world cable. In 1958 he became director of research but retained control of all major submarine cable projects.

The chairman of the North Eastern Centre for the forthcoming session is Mr. Philip Richardson, M.I.E.E., D.L.C., who has been deputy chief electrical engineer for C. A. Parsons & Co., Ltd., since 1950. Mr. Richard-



Mr. P. Richardson



Prof. J. E. Parton

son started his engineering training at Loughborough College in 1925, subsequently serving a student apprenticeship at Parsons. He read three papers before the North Eastern 'Centre Students' and 'Graduates' Section and received a students' premium for one of them. He became secretary of the Section in 1935 and chairman in 1936. In 1945 Mr. Richardson presented his first paper before the senior section, entitled "Stray Losses in Synchronous Electrical Machines," and in 1958 one on "Design and Application of Large Solid Rotor Asynchronous Generators."

Professor J. E. Parton, B.Sc., Ph.D., M.I.E.E., A.M.I.Mech.E. (East Midland Centre), was appointed to the Chair of Electrical Engineering at



Dr. J. S. Forrest



Dr. H. G. Taylor



Mr. W. S. Elliott



Mr. R. J. Halsey

Nottingham University on the retirement of Professor H. Cotton in 1954 and is at present also Dean of the Faculty of Applied Science at the University. Prof. Parton received his training at Cannock Chase Mining College, Birmingham University and the Post Office Engineering Department training school. In 1946 he was appointed lecturer in electrical engineering at Glasgow University and in 1949 became lecturer in electrical machinery to final year students. During the last war he served in the R.N.V.R., being demobilised with the rank of electrical lieutenant-commander. He is the author of a number of publications and theses on electrical subjects.

**Mr. W. J. A. Painter, A.C.G.I., D.I.C., M.I.E.E.** (North Midland Centre), is regional electrical engineer, North Eastern Region, Central Elec-



Mr. T. Gill



Mr. T. G. C. Harrop



Mr. C. F. Freeman



Prof. E. G. Cullwick

was a draughtsman at Coventry Ordnance Works, Siemens Dynamo Works, Stafford, and English Electric Co., London, before joining the St. James & Pall Mall Electric Supply Co. in 1922. In 1937 he was appointed chief engineer to take over the Brompton & Kensington and the Kensington & Knightsbridge companies in connection with an amalgamation of the six London companies,

which became known as Central London Electricity, Ltd. In 1940 he was appointed chief engineer of the Westminster and Chelsea Districts and in 1941 chief engineer of the Charing Cross and City Districts. From 1945

until he took up his present position in 1949 Mr. Pegg was assistant export manager, English Electric Co., Ltd.

**Mr. C. H. Flursheim, B.A., M.I.Mech.E., M.I.E.E., Mem.A.I.E.E.**, director and chief engineer, A.E.I. (Manchester), Ltd., has been elected chairman of the North Western Centre. Mr. Flursheim was educated at Wellington College and Trinity College, Cambridge. He served a college apprenticeship with the Metropolitan-Vickers Electrical Co., Ltd., and afterwards joined the Switchgear Engineering Department, spending a year with the General Electric (U.S.A.) as an I.G.E. fellowship student. During the war period he was responsible for the development of a series of electrical components for aircraft, including electro-mechanical undercarriages, retraction units and miniature circuit-breakers. In 1945 he became assistant chief engineer, and in 1949 chief engineer, Switchgear Department. He was appointed assistant chief electrical engineer of the company in 1953 and became chief electrical engineer in 1957. Mr. Flursheim has read many papers before the I.E.E. and other technical institutions.



Mr. W. J. A. Painter



Mr. C. H. Flursheim



Mr. R. N. Pegg

tricity Generating Board. He served his apprenticeship at H.M. Dockyard, Portsmouth, where he gained Whitworth and Kitchener Memorial Scholarships, and continued his education at the City and Guilds College, London. After five years with Standard Telephones & Cables, Ltd., he joined the Central Electricity Board (Mid-East England) and in 1948 was appointed divisional technical engineer to the Yorkshire Division of the British Electricity Authority, taking up his present appointment in January of this year.

Mr. Painter is chairman of the Electrical Engineering Advisory Committee and a governor of Leeds College of Technology; and a governor of the Leeds Branch College of Engineering and Science.

**Mr. R. N. Pegg, M.I.E.E., A.M.I.C.E.** (Mersey and North Wales Centre), is manager of No. 4 Sub-Area of the Merseyside and North Wales Electricity Board. He received his technical education at Coventry Technical School and the Regent Street Polytechnic, London, and was an engineering pupil at the Coventry Ordnance Works. After being in the submarine service from 1917 to 1919, Mr. Pegg

**Mr. T. Gill, B.Sc., M.I.E.E.** (Western Centre), was educated at Manchester University, graduating with first-class honours. He started his career in 1925 as a college apprentice with the Metropolitan-Vickers Electrical Co. In 1936 he was appointed sales engineer at the company's Cardiff office with special responsibility for mining equipment, becoming sub-office manager at Swansea in 1952. Since 1959 he has been district manager, A.E.I., Swansea. With the Institution, Mr. Gill has held the positions of hon. assistant secretary, Western Centre; chairman, Western Centre Utilisation Group; and chairman, West Wales (Swansea) Sub-Centre. He is a past-president of the South Wales Branch of the Association of Mining Electrical and Mechanical Engineers.

**Mr. T. G. C. Harrop, M.B.E., M.I.E.E.** (Southern Centre), has been with J. I. Thornycroft & Co., Ltd., since 1936, becoming electrical manager of the company in 1950. He received his technical education at Rutherford Technical College, Newcastle-upon-Tyne, and his training with Palmers Shipbuilding & Iron Co., Ltd., Jarrow. Before joining Thornycroft he held appointments with Cammell Laird & Co., Ltd., Vickers-Armstrongs, Ltd., and William Gray & Co., Ltd.

**Mr. C. F. Freeman, B.Sc.(Eng.), M.I.E.E., M.Amer.I.E.E.** (South Midland Centre), was educated at Churche's College, Petersfield, and the University College (now University) of Southampton. After training with the B.T.H. Co. at Rugby and serving in the Turbine Construction Department he was for three years assistant mechanical and electrical engineer with Ariston Gold Mines (1929), Ltd., in Gold Coast Colony (now Ghana). He returned to the B.T.H. Co. in 1934 and in the following year joined Courtaulds, Ltd., at their engineering headquarters at Coventry, where he is now chief electrical engineer. Mr. Freeman represents the I.E.E. on the board of governors of the recently-opened Lanchester College of Tech-

(Continued on page 552)

# PERSONAL AND SOCIAL

## News of Men and Women of the Industry

**Sir Willis Jackson, F.R.S.**, who since 1953 has been director of research and education of Associated Electrical Industries (Manchester), Ltd., relinquished his appointment on 30th September to become Professor of Electrical Engineering at Imperial College, University of London. **Dr. J. M. Dodds, O.B.E.**, has been appointed director of the A.E.I. Research Laboratory, Manchester.

On 25th September at a very large gathering of members of the Research Laboratory Dr. Dodds presented on their behalf a canteen of cutlery to Sir Willis and extended to him and to Lady Jackson their best wishes for the future.

In making the presentation Dr. Dodds mentioned that Sir Willis, in his capacity as an A.E.I. research consultant, would continue his association with the laboratory. Dr. Dodds paid tribute to Sir Willis's many contributions to research and the advancement of education and training.

In expressing thanks Sir Willis said that it had been evident for many years past that steps must be taken to achieve a much fuller measure of co-ordination of A.E.I. research—indeed of research within the electrical industry generally—and he hoped that the members of the Manchester laboratories would adapt themselves enthusiastically to such organisational changes as this might involve.

On the following evening Sir Willis received more presentations, from

members and ex-members of the A.E.I. Manchester Education Department. Mr. B. Dawkins, education manager, handed him a clock and an iron scroll-work plant stand, the latter having been made in the Apprentice Training School.

Dr. Dodds graduated M.A. and B.Sc. (Physics) at Aberdeen University in 1926, and B.Sc. (1st class hon.) in mechanical engineering in 1928. On



Dr. J. M. Dodds

completion of a graduate apprenticeship with Metropolitan-Vickers in 1931 he was awarded a travelling scholarship to Aachen University where he gained the degree of Dr. Ing. He was appointed physicist in the Radio Section of the company's Research Laboratory at Manchester in 1933, working on high-power radio transmitters, and became responsible in 1937 for the development of the c.r. radar transmitters employed throughout the second world war for early warning of approaching aircraft. His work on many radar devices continued until 1945 and received public recognition in the award of the O.B.E. in 1944. He later became group leader in charge of the work of the Mechanical, Metallurgical, Physical Metallurgy,

Radio and Process Laboratories. In 1956 he was appointed assistant manager of the Research Laboratory and manager in 1957.

**Mr. J. G. Wellings, M.I.E.E.**, consultant on instrument transformers, transformer engineering department, Rugby, A.E.I. Transformer Division, retired at the end of September, after forty-six years' service with the company. He was presented, on behalf of his Rugby colleagues and friends, with home workshop tools, a pipe and tobacco, and an autographed album, by Mr. K. W. McBain, chief engineer of the Transformer Engineering Department. Mrs. Wellings received a handbag.

Mr. Wellings has been one of the company's representatives on B.E.A.M.A., B.S.I. and I.E.C. Committees and he was also a member for some years of the Technical Committee of the former Electric Discharge Lamp Auxiliaries Council. He has been the author of papers for the I.E.E., the Paris H.V. Conference, and the technical Press.

**Mr. A. C. MacQueen, A.H.W.C., M.I.E.E.**, retired on 30th September from his appointment as Birmingham Area engineer of the Midlands Electricity Board, in which he has served since the Board was established in 1948, following 22 years' service previously on the engineering staff of the Birmingham Corporation Electric Supply Department. As previously announced he is succeeded by **Mr. R. H. Rockliffe, A.M.I.E.E.**



Mr. A. C. MacQueen  
Electric Supply  
Department

### I.E.E. CHAIRMEN (continued)

nology, Coventry, and is chairman of its Electrical Engineering Advisory Committee. He is particularly interested in standardisation, being one of the initial members of the Engineering Equipment Users' Association, and he is chairman of the B.S.I. Committee dealing with standardisation of motor dimensions.

**Professor E. G. Cullwick, O.B.E., D.Sc., M.A., M.I.E.E., F.R.S.E.** (Scottish Centre), became the first Watson-Watt Professor of Electrical Engineering at St. Andrews University in 1949 and was first Dean of the Faculty of Applied Science from 1955 to 1960. He was born at Wolverhampton and educated at Wolverhampton Grammar School and Cambridge University. After serving a student

apprenticeship with the British Thomson-Houston Co., Ltd., Rugby, he went to Canada in 1926 to take up an appointment with the Canadian General Electric Co. In 1928 he was appointed Assistant Professor of Electrical Engineering at British Columbia University, where he was later Associate Professor, and in 1937 he was appointed Professor at Alberta University. During the war he acted as Director of Electrical Engineering, Naval Service Headquarters, Ottawa, and from 1947 to 1949 he was Director of Electrical Research, Defence Research Board, Ottawa. Professor Cullwick has published various research papers, and is the author of "The Fundamentals of Electromagnetism."

Mr. MacQueen was educated at Pitlochry High School and at the Heriot-Watt College, Edinburgh, of which he is an associate. In 1922 he joined the engineering staff of the Ayrshire Electricity Board and was subsequently with the B.T.H. Co., Rugby. He joined the Birmingham Corporation undertaking in 1926 as an assistant engineer in the meter department and subsequently held progressive posts as assistant district engineer, design and development engineer, assistant mains engineer,

deputy mains engineer and deputy distribution engineer. In 1932 he was joint author of an I.E.E. paper on the problems and advantages of change-over from d.c. to a.c. which was awarded a premium. He was engaged on the change-over of the Birmingham system. In 1945 he supervised the design and installation of the first 132 kV transmission system established by a municipal undertaking.

**Mr. G. F. Slade, B.Sc., M.I.E.E.**, has been appointed deputy chief engineer of the Midlands Electricity Board to succeed **Mr. R. A. York, B.Sc., M.I.E.E.**, who takes up the appointment of chief engineer of the East Midlands Electricity Board on 1st November.

Mr. Slade was educated at Handsworth Grammar School and at the University of Birmingham, where he gained an honours degree in electrical engineering. He started his career in the electricity supply industry with the Midland Electric Corporation for Power Distribution, Ltd., and was district engineer at Bilston from 1938 to 1941. He then joined the Royal Naval Volunteer Reserve and served until his release in 1946 with the rank of lieutenant-commander.



Mr. G. F. Slade

Returning to the Midland Electric Corporation, he was maintenance and public lighting engineer until nationalisation in 1948, when he became maintenance engineer and then constructional engineer for the South Staffs. and North Worcs. Sub-Area of the Midlands Electricity Board. In 1954 he moved to the M.E.B. headquarters as assistant chief engineer (distribution), the post he is now relinquishing.

To mark the completion of 50 years' trading and contracting in the Watford area, **J. W. Russell, Ltd.**, held a jubilee luncheon on 28th September at Watford Town Hall. Approximately 300 guests, representing customers, suppliers and other business associates, were received by Mr. J. W. Russell and Mr. D. T. Russell (directors), sons of the founder. Proposing a toast to "The Firm," Mr. W. A. Everts said that he had followed the progress of the company for many years and had seen it grow from its original staff of three to its present 150 employees. The company, he said, now concerned itself with all sides of the industry, including retailing, wholesaling, con-

tracting and automotive electrics. In his reply Mr. D. T. Russell paid a special tribute to the staff, some of whom had been with the company since its inception. The Mayor of Watford, on behalf of the town, offered congratulations.

**Mr. J. W. Warner, M.A., M.I.Mech.E., A.M.I.E.E.**, has been appointed to the board of Alkaline Batteries, Ltd., Redditch, Worcs. He was educated at Malvern and Clare College, Cambridge, graduating in 1923 with honours in mechanical engineering, and received practical training with J. I. Thornycroft & Co. before joining the Anglo-Persian Oil Co. (now B.P., Ltd.) as refinery development engineer. In 1931 he joined the Chloride Electrical Storage Co., Ltd., and was appointed general manager for India. Mr. Warner was appointed general manager of Alkaline Batteries, Ltd., in 1946.



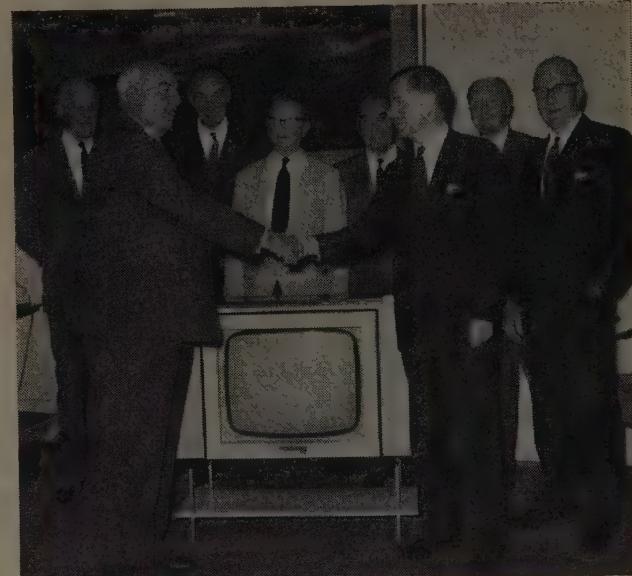
Mr. J. W. Warner

the Woolwich Works during his 22 years there. Mr. Giffin also received a silver fruit dish from the senior executives of the A.E.I. Cable and Telecommunications Divisions (two of the four Product Divisions under the management of A.E.I. Woolwich) and a tea service from A.E.I. Plastics (Aldridge), Ltd.

Mr. Giffin was educated at the Royal Grammar School and Armstrong College, Newcastle-on-Tyne, and Hartley University, Southampton. He joined the Pirelli-General Cable Works in 1915 as a junior assistant and eventually became chief of the engineering, maintenance and factory construction departments. He went to Siemens Bros. & Co., Ltd., Woolwich, in 1939, as assistant cable works manager. In 1940 he was appointed cable works manager, and in 1942 became general works manager at Woolwich; he was later responsible for the establishment of Siemens Bros.' factories at Spennymoor and Hartlepool, Co. Durham. He was made a director of Siemens Bros. in 1947 and has remained a director of the subsequently formed companies of Siemens Edison Swan, Ltd., and Associated Electrical Industries (Woolwich), Ltd.

Mr. Giffin was made an M.B.E. in 1944 for his services in maintaining production during continuous air-raids and for the part he played as a member of the team which developed and produced the prototype cable for the "Pluto" (pipe line under the ocean) operation by which Britain and France were linked after the invasion of France.

**Mr. K. G. Smith, F.I.A.**, has been appointed deputy secretary of the General Electric Co., Ltd., with effect



Dr. J. N. Aldington presents Mr. G. W. Giffin with a television receiver

from 1st October. This appointment is in addition to his existing duties as G.E.C. pension fund secretary and investment manager. **Mr. N. Poyner**, F.C.W.A., formerly deputy financial controller of the Viscose Division of Courtaulds, Ltd., has been appointed chief cost accountant to the G.E.C. By arrangement with Courtaulds he took up his new duties on 2nd October.

**Mr. W. L. Bentley**, A.M.I.E.E., district commercial engineer of the Spalding District of the East Midlands Electricity Board, has been appointed to succeed **Mr. H. L. Jones**, A.M.C.T., M.I.E.E., as commercial officer of the Derby and Burton Sub-Area, who is retiring in November. Mr.



Mr. W. L. Bentley

Bentley has served in the electricity supply industry for 25 years. After completing his education at the Leicester College of Technology he joined the Buckrose Light & Power Co. at Driffield in 1936 as consumers' engineer. Three years later he became district engineer with the Boston & District Electric Supply Co., Ltd., a position which he held until nationalisation when he took up his present appointment.

**Mr. J. R. Gandy**, A.M.I.E.E., of the Hackbridge & Hewittic Electric Co., Ltd., is taking up a new appointment at the company's head office at Hersham. His position as area manager, Merseyside, N. Wales and N.W. England, is being taken by **Mr. E. Hanson**, B.Sc.Tech., A.M.I.E.E., who until recently was with the English Electric Co. at Stafford, and previously for many years with Metropolitan-Vickers, Manchester.

**Mr. R. C. Barrett**, F.C.A., F.C.I.S., formerly secretary of the South Western Division of the C.E.G.B., has been appointed deputy regional secretary, South Western Region, with effect from 1st October. From 1931 to 1948 he was accountant and assistant secretary to Christy Brothers & Co. and their associated electricity supply companies.

**Mr. M. F. A. George** is now public relations officer for the South Western Region. In 1959 he was appointed Press officer to the United Kingdom Atomic Energy Authority.

**Mr. G. O. James**, A.M.I.E.E., M.B.I.M., has been appointed personnel officer of the South Western

Region of the Central Electricity Generating Board. He entered the service of the Swansea Corporation Electricity Department in 1925, becoming distribution engineer.

On the formation of the British Electricity Authority in 1948 he was appointed district labour relations officer, Southern District, and in 1954 was transferred to the London District. In 1958 Mr. James was appointed labour relations officer, C.E.G.B. headquarters.

**Mr. J. W. Menter**, M.A., Sc.D., F.Inst.P., has been appointed director of the Tube Investments Research Laboratory at Hinxton Hall, near Cambridge. During seven years at Hinxton, Dr. Menter has been leading research teams studying the micro-structure of metals and has promoted notable advances in the techniques of electron microscopy and X-ray micro-analysis.

The South Wales Electricity Board has appointed **Mr. J. Panton**, A.M.I.E.E., as assistant chief engineer (meters). He will assist the Board's chief engineer on all matters associated with energy metering and will also manage the new central meter testing station now under construction at Cardiff. Mr. Panton has been meter engineer for the Southall Sub-Area of the Southern Electricity Board for the past ten years.

**Mr. F. French** has been appointed director and general manager of Edmundsons Electrical Wholesalers,

Ltd. Mr. French joined the former Sloan Electrical Co. in 1926 and became director and general manager. When the Sloan Company was amalgamated with Alliance Wholesale and Simpson Baker to form Edmundsons Electrical



Mr. F. French

Wholesalers, Ltd., he was appointed a director of the new company.

The B.B.C. has appointed **Mr. L. G. F. Shuttleworth** as engineer-in-charge of the Tatsfield receiving and measurement station in succession to the late **Mr. H. V. Griffiths**, M.B.E.

At the annual general meeting of the British Standards Institution last week **Mr. Geoffrey Cunliffe** (managing director of Norcros, Ltd.) was elected president in succession to **Mr. R. E. Huffam**. Mr. Cunliffe had earlier been elected chairman of the General Council.

Mr. Huffam, who has been presi-

dent for three years, was elected a deputy-president. **Mr. A. D. Bonham-Carter** (Unilever, Ltd.) succeeds Mr. Cunliffe as chairman of the Finance Committee. **Sir Anthony Bowlby** (Guest, Keen & Nettlefolds, Ltd.) was appointed chairman of the Engineering Divisional Council in succession to **Sir Stanley Rawson**, whose term of office had expired.

**Sir John Dean** has retired from the board of British Insulated Callender's Cables, Ltd., and certain subsidiary companies to devote his time to the chairmanship of Submarine Cables, Ltd., in which B.I.C.C. and A.E.I. have equal shares.

**Mr. William H. Rigg**, B.Sc., has been appointed managing director of Firth Cleveland Tools, Ltd., a member of the Firth Cleveland Group. He will operate from the company's Tipton Works, Staffordshire. He has been managing director of the Revo Electric Co., Ltd., for the past three years.

Mr. W. H. Rigg

Mr. J. M.

**Hodge** has been appointed export manager of M. & C. Switchgear, Ltd., in addition to his present position of London office manager.

**Mr. C. F. Needham**, until recently southern branch manager with Hoover, Ltd., has retired after 33 years with his company.

**Mr. J. Land** has been appointed divisional chief estimator of the A.E.I. Switchgear Division.

#### OBITUARY

**Mr. Russell Stuart Wright**, M.I.E.E., former managing director of Newton & Wright, Ltd., died on 1st October at the age of eighty-five.

**Mr. H. Rigby**, a director of L. G. Hawkins & Co., Ltd., died suddenly, after a short illness, on 26th September.

**Mr. Angus Ferguson**, late manager of the Inverness branch of the General Electric Co., Ltd., died on 14th September. He was 58, and had been with the G.E.C. in Inverness for 25 years, retiring only a few weeks ago.

**Mr. A. H. Midgley**.—The death is reported, on 1st October, of **Mr. Albert Henry Midgley**, M.I.E.E., of Moor Park, Northwood, Middlesex. Mr. Midgley was with C. A. Vandervell & Co. for some years and then formed Midgley Harmer, Ltd., electronic equipment manufacturers, of which he was chairman until his death.

## INDUSTRIAL NEWS

### Lighting London's Roads

THE Consultative Committee on the Lighting of Traffic Routes within the London Conurbation published its final report on Wednesday. The interim report in 1959 recommended that no traffic route should have less than 5,000 lumens per rooft of road, and that the minimum height of light sources should be 25ft. The Committee also recommended that there should be consultation between local authorities and, in the final report just published, it says that the general impression is that there has been a large measure of co-ordination and a reasonable level of illumination uniformity along traffic routes. The Committee considers that the replacement of poor existing installations should not be allowed to await projected road improvements. Statistics show that a much improved system of street lighting may reduce road accidents by as much as 30 per cent.

In the interim report, the question of the recommendation of one type of lighting source in preference to others was referred to a later stage. The Committee has now come to the general conclusion that in terms of visibility to road users, there is little to choose between fluorescent, colour corrected mercury and sodium lighting. The Committee has, therefore, decided to confine its recommendations in its final report to the level of lighting in terms of lumen values.

It is now thought that the minimum illumination given in the interim report is insufficient for heavy traffic routes. There should be an absolute minimum of 7,000 lumens per rooft on such roads while on medium traffic routes only the minimum should remain at 5,000 lumens. However, it is recommended that all local authorities should try to achieve a target figure of 10,000 lumens per rooft

of road on heavy traffic routes and 7,000 lumens on medium traffic routes, within three years. Other recommendations are that all traffic routes in Greater London should be continuously lit throughout the night; technical investigations should continue to be made into the possibility of simultaneous switching "on" and "off" of street lighting over the whole of the Greater London area; and central mounting of street lighting should not be used except in exceptional circumstances.

### E.C.A. YEAR BOOK

As usual the 1961-62 Electrical Contractors' Year Book, published by the Electrical Contractors' Association, 14, Bedford Row, London, W.C.1, at 25s (plus 2s 6d postage), is a bulky volume (734 pp.) containing a great deal of information useful to contractors and those who employ them. Most of the sections have been retained: one notable deletion has been the Electrical Fair Trading Policy, following upon the winding-up of the Fair Trading Council at the end of last year. New features are a map of England and Wales showing the boundaries of the E.C.A.'s sections and branches and a brief article upon the constitution and objects of the National Inspection Council for Electrical Installation Contracting.

### Large Egyptian Power Station Contract

THE English Electric Co., Ltd., has been awarded a £6 million contract by Cairo Electricity and Gas Administration for a 120 MW extension to the Cairo South power station. This order, one of the largest obtained for British industry in the Middle East since 1957, was gained in the face of intense competition from firms in Britain, Czechoslovakia, France, Germany and the United States. The existing generating plant is of Continental manufacture. The first call for tenders was in June, 1960, and the specification covered boilers, turbo-alternators and auxiliary equipment. Part of the payment will be in cotton, arranged in conjunction with the international firm of cotton merchants, Louis Dreyfus & Co., Ltd.

Although the English Electric Co.

are the main contractors and will co-ordinate the complete project, it is an Anglo-Egyptian enterprise in that Misr Concrete of Cairo have a £750,000 contract for the civil engineering work. The two 60 MW steam turbines will be made at the Rugby works of the English Electric Co., the alternators, transformers (including two rated at 75 MVA) and 63 kV switchgear at Stafford, and the low voltage switchgear and fusegear at Liverpool. The four boilers, each of 441,000 lb/hr capacity, will be manufactured by Simon-Carves, Ltd. The plant will be in operation early in 1964.

### LABOUR PARTY EXPELS E.T.U.

At the opening of the Labour Party Conference at Blackpool on Monday the decision of the National Executive to expel the Electrical Trades Union from membership was confirmed. A motion to refer the matter back was defeated by 5,337,000 votes to 642,000.

### Educational

Seven lectures on "Efficient Lighting for the Retail Trade" has been arranged by the Huddersfield College of Technology in conjunction with the British Lighting Council. They will be given on Tuesdays at 7.15 p.m. beginning on 10th October. The course fee is one guinea.

### Bylock Buy Phoenix Appliances

Bylock Electric, Ltd., announce that they have acquired the whole of the share capital of Phoenix Appliances, Ltd., and will be continuing the manufacture of the various models of Phoenix vacuum cleaners and floor polishers from their works at Enfield and Waltham Cross. The future board will be Messrs. H. J. Latham, C. J. Mathes, H. Kaufmann, L. W. Moscrop, F.C.A., and A. H. Lightfoot.

### Electricity from Water Supply

Liverpool Corporation proposes to erect hydro-electric plant in connection with its £26 million water supply scheme at Tryweryn, North Wales. The Water Committee has decided to install sufficient plant, in the first place, to cater for the needs of the scheme itself, but it also proposes to ascertain from the Merseyside and North Wales Electricity Board the terms on which it would purchase electricity from a larger plant. At the same time the Parliamentary Committee has been asked to take steps to obtain powers to generate electricity for sale.

In a letter to the *Liverpool Daily Post*, Councillor H. Evans, a member of the Liverpool Corporation, says that the Water Committee proposed that while, initially, plant sufficient to meet the requirements of the water scheme should be installed, buildings should be erected to accommodate further plant. Councillor Evans was in favour of installing the larger plant immediately. He considers that all water schemes of this magnitude should incorporate hydro-electric generation.

INDUSTRIAL NEWS *[continued]*

## New Scottish Factory

THE new factory for Aircraft-Marine Products (Great Britain), Ltd., on the Port Glasgow industrial estate, officially opened by the Secretary of State for Scotland on 25th September, marks a significant step forward for this expanding British company. It occupies an area of 60,000 sq ft and will enable the company to increase production of its solderless terminals, connectors and associated products.

Aircraft-Marine Products first began to produce the A-MP solderless terminals in Britain in 1956 and by 1960 the company's level of business had multiplied many times; in the last financial year its 1959 business was doubled. Basically, the technique incorporates precision engineered contacts for wires that, when attached to circuits in any electrical system by precision-controlled crimping tools, provide the best possible connections. More than 15,000 designs of terminals have been developed and are supplied

### ELECTRICAL INDUSTRIES BALL

The Electrical Industries Benevolent Association announces that, once again, the demand for tickets for the Electrical Industries Ball is exceeding the number of guests that can be accommodated in the Great Room at Grosvenor House. The ball is being held on 10th November.

### Automatic Steel Rolling Mill

A new automatic programming system for steel rolling mills has been developed by the English Electric Co., Ltd. The system uses punched cards to store "rolling programmes," the complete sequence of screwdown, manipulator and mill speed settings and the number of passes in a rolling operation.

The system is an advance on the uniselector system introduced by the company two years ago since it offers a greater programme storage capacity than can be economically obtained with uniselectors. The benefits are the same in that the operator, relieved of the routine rolling, can do his job better and more easily, producing during his shift more steel of more consistent quality. He can always take manual control to correct rolling faults. The first installation of the new system is at the Hallside reversing billet mill of Colvilles, Ltd., where it is controlling the screwdown.

in many forms designed for the needs of individual industries.

In the domestic appliance field A-MP terminals, connectors and splices are to be found in appliances ranging from electric blankets to the most advanced types of washing machines. Special products are avail-

able for the electrical appliance industry and the company have recently conducted a series of tests on snap-on connectors in conjunction with the Electrical Development Association and the British Electrical and Allied Manufacturers' Association.

There is also a wide diversity of the terminals used in the electronics industry, while in commercial applications miniature "Faston" receptacles are used throughout the radio and television field.

## Engineering Wages Claim

REPRESENTATIVES of the Engineering and Allied Employers' Federation on 27th September heard from leaders of the Confederation of Shipbuilding and Engineering Unions their case for a "substantial" increase in pay for the members of the affiliated engineering trade unions, coupled with a reduction of the working week from 42 to 40 hours. They also demanded equal pay for women in the engineering industry. Mr. W. J. Carron, president of the Amalgamated Engineering Union, repudiated the Government's policy on wages and said that the claim was based on the increased cost of living, greater productivity, and the increased profitability of the engineering industry. On the subject of hours, he contended that British engineering workers' hours were longer than those of German and French workers. Unless the working week was reduced the increasing use of automation would result in unemployment. Mr. Carron said the rate for a skilled craftsman was still less than

£10 a week while the average weekly wage of all the workers in manufacturing industry, skilled and unskilled, was nearly £16.

The employers, it is reported, did not reply to the claims except to agree to consider them and give the result of their deliberations at a future meeting. They did, however, concede two minor claims relating to shift workers and holiday pay.

Although no specified amount is being claimed it is believed that £1 a week increase is envisaged. About three million workers are concerned.

### Earthing in Rural Areas

Warning of the danger to people and cattle through unsatisfactory earthing methods was given at a meeting at Exeter of the South Western Electricity Consultative Council. The secretary (Capt. R. C. Wield) recalled that the Council had informed the South Western Electricity Board that consumers in rural areas were being put in a difficult position because water boards were using non-conducting mains instead of metallic mains. The Electricity Board had replied that the problem was being considered at national level.

Mr. J. M. Scoble complained of "the inactivity of the people in London." Mr. R. F. Richardson, the Board's chief commercial officer, said that, legally, earthing was the responsibility of the consumer.

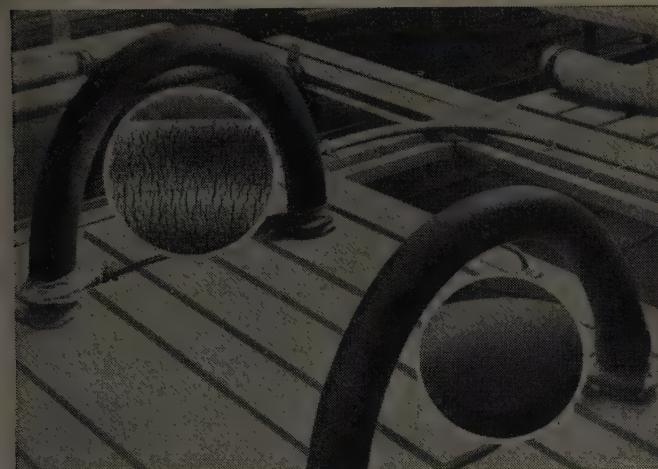
### World's Largest Generator

According to a report in the *Financial Times* the largest generator in the world, with a capacity of more than 1,000 MW, has been ordered by Consolidated Edison to supply power to the New York Metropolitan area. The order, which is valued at about £47 million, has been placed with Allis-Chalmers.

ALUMINIUM ingots	ton £186 0s 0d
COPPER, H.C. Electro	ton £220 10s 0d
Fire Refined 99.70%	ton £219 0s 0d
Fire Refined 99.50%	ton £218 0s 0d
COPPER Tubes ..	lb 2s 3d
Sheet .. ..	ton £256 5s 0d
H.C. Wire and strip ..	ton £275 5s 0d
LEAD, English ..	ton £61 15s 0d
Foreign .. ..	ton £60 0s 0d
MERCURY .. ..	flask £62 0s 0d
TIN, block (English) ..	ton £944 0s 0d
ZINC, G.O.B. Foreign	ton £71 10s 0d
BRASS Tubes (solid drawn) .. ..	lb 1s 9d
Wire .. ..	lb 2s 7d
PHOSPHOR BRONZE	lb 4s 1d
Wire .. ..	oz £30 5s 0d
PLATINUM .. ..	lb 24s d—24s d
RUBBER, No. 1 R.S.S.	
spot .. ..	



**No plastic flow with neoprene.** It is vulcanized, does not revert and flow. Neoprene sample (left) compressed 8 hours at 75 psi at 302°F. was practically unaffected. Thermoplastic sample breaks down under test.



**Weather resistance with neoprene.** Neoprene cable jacketing (right) remains lively and tough after continuous exposure to sun and weather since 1935. Natural rubber jacket is badly deteriorated.



**Outstanding impact resistance with neoprene.** Tons of jagged rock caved in on this 5,000 volt cable. Its neoprene jacket was practically undamaged and power continued to flow.

## Du Pont neoprene jacketing for all-round resistance

Du Pont neoprene's reputation as jacketing for wire and cable has been earned by over twenty years of tough and varied service. Its outstanding performance is based on a combination of properties unequalled by any other jacketing material. Du Pont neoprene offers balanced resistance to all the causes of deterioration — weather, sunlight, ageing and wide temperature variations; flame and ozone; oil and grease; many organic and inorganic chemicals; soil acids and galvanic action . . . as well as severe impact, abrasion and cutting.

Specify and use Du Pont neoprene — its time-tested record is your guarantee of all-round protection and long-term economy.



**Chemical resistance with neoprene.** In direct-burial installations neoprene protective jacketing prevents deterioration of the lead sheath due to galvanic action and chemical corrosion.



**DU PONT NEOPRENE**  
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

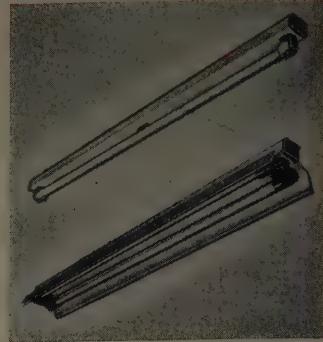
Distributors Du Pont Company (United Kingdom) Ltd., 76 Jermyn Street, London SW1

Du Pont Company (United Kingdom) Ltd.,  
76 Jermyn Street, London, SW1, England.  
Electrical Review — 10/61 — G.8.

Please send me booklet A7122 telling how DuPont  
Neoprene protects wire and cable.

NAME \_\_\_\_\_  
POSITION \_\_\_\_\_ COMPANY \_\_\_\_\_  
ADDRESS \_\_\_\_\_  
CITY \_\_\_\_\_ COUNTRY \_\_\_\_\_

... for Lighting, for Switchgear  
for quality, for service, choose Simplex



The Simplex General Purpose Floodlight Projector is available in narrow beam, wide angle, and elliptical beam types. The heat resisting glass front is set in a weatherproof ring.

150w—2000w lamps.

The Simplex Airflo high-bay fitting is extremely light to handle. Its one-piece spun aluminium reflector is self-cleaning. The Simplex Discos device included with this fitting allows instant connection to the conduit system.

250w—1000w lamps.

The Simplex Wall Bracket is just one of a most comprehensive, all-purpose Screwglass range. These modern fittings are weatherproof and corrosion resistant and are available in colours.

40w—200w lamps.

The Simplex ACF (anti-corrosion fluorescent) fitting is protected by a specially patented process that will not rust even in the heaviest corrosive atmospheres.

20w—125w tubes.



The Simplex Star switchfuse designed for front operation and for either HRC or rewirable fuses. The Star range of 500 volt switchfuses, distribution fuseboards, busbar chambers and switchboard assemblies is complementary to the Regent and Monarch ranges of Simplex switchgear.

# Simplex

SIMPLEX ELECTRIC COMPANY LIMITED  
CREDA WORKS, BLYTHE BRIDGE, STOKE-ON-TRENT, STAFFS.  
Branches throughout Great Britain and Agents throughout the World

In the electrical field, Simplex have been out in the lead for 60 years. Significant? Not very. We are looking ahead, not back. We are very happy to be so far in advance now, at this point in time. We intend to stay there next year, in ten years, as long as the best brains in the industry can keep us there. This isn't just a paean of self-praise. It's a cogent reason for keeping in touch with Simplex developments, for specifying Simplex equipment, for thinking of Simplex first, every time.



Simplex Regent range. Robust but stylishly designed 500 volt switchgear of conventional construction.



Simplex Monarch 500 volt 150 and 300 amp switches and fuse switch of robust all-cast construction suitable for heaviest duty.

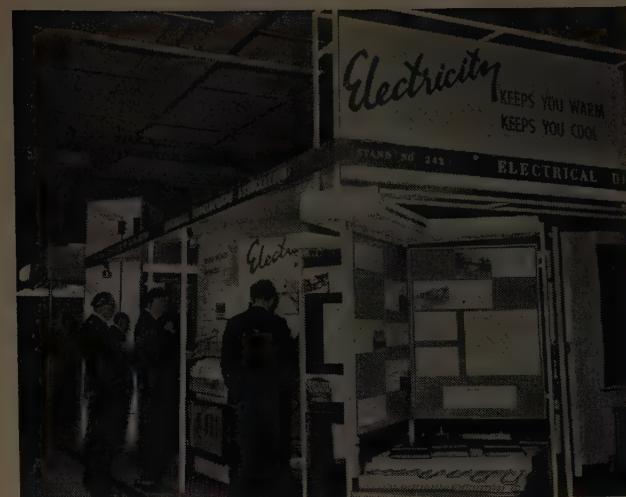
INDUSTRIAL NEWS *[continued]*

## Heating and Ventilating Exhibition

THE first International Heating, Ventilating and Air Conditioning Exhibition was opened by Mr. C. J. Atkins, M.I. Plant E., at Olympia, London, on 26th September. The exhibition was, he said, concerned not only with the comfort aspect but also with improvements of working conditions in factories, clean air and atmospheric pollution. Over 220 exhibitors are taking part in the display, which closes today (Friday) at 4 p.m.

The superiority of electrical heating and air conditioning methods are illustrated on the Electrical Development Association's stand. Twelve different forms of electrical heating are shown together with various automatic control systems. Five different air conditioning units and a dehumidifier are also displayed. Many companies in the electrical industry are participating in the exhibition, which is sponsored by the Institution of Heating and Ventilating Engineers, who have also organised a concurrent

General view of the Electrical Development Association's stand



international conference. The three main themes of the conference are advances in training, education, contract planning, costing, the organisation of site work, and research; the

technical advances likely in the next ten years; and the integrated design of architectural and engineering services for economy of building construction.

## HOME DEMAND FOR REFRIGERATORS IMPROVES

Deliveries of British-made domestic refrigerators to the home market in July totalled 108,130. This is an increase of 10.3 per cent on July, 1960—the first month in which the impact of the new hire-purchase restrictions was fully felt.

Total deliveries for the first seven months of this year reflect the downward trend in demand caused by fluctuating Government policy over the past few months. Deliveries from January to July inclusive (642,677) fell by 14.5 per cent over the same period last year (751,408).

The drop in export demand this month is substantial. Deliveries to overseas markets were only 8,397, a decrease of 24.2 per cent compared with July, 1960.

## Extension of Telex Service

G.P.O. subscribers in the United Kingdom can now dial direct to all Telex lines in nine countries, Austria, Belgium, Denmark, France, Luxembourg, the Netherlands, Sweden, Switzerland and West Germany. Automatic Telex service is expected to be extended to Italy, Finland and Norway by the end of the year, and to other countries later.

## Engineering Production and Orders

THE volume of production in the electrical industry in the second quarter of 1961 was 4 per cent higher than a year earlier. Deliveries of rotating machinery and wires and cables have increased substantially. Deliveries of electrical equipment for vehicles rose in the second quarter after being depressed at the end of 1960 and in the early months of 1961. Domestic appliance deliveries were 11 per cent more than in the second quarter of 1960 when deliveries were falling after the imposition of hire-purchase controls at the end of April.

Output in the mechanical sector was up by 11 per cent in the second quarter and the Board of Trade provisionally estimates that the volume of production in the engineering and electrical goods industries in July was

16 per cent more than in July, 1960. The volume of new orders was up by 11 per cent, and much of the increase was in overseas orders which rose sharply. There has been little change in the volume of orders in hand since the end of April.

## A.E.I. Control Equipment for Russia

An order for eighteen control centres, valued at about £70,000, has been obtained by the Motor and Control Gear Division of Associated Electrical Industries, Ltd., from Constructors John Brown, Ltd. The equipment will be used to control the electric motors in two projected Russian detergent plants, one at Volgadonsk and the other at Shebekino.

DELIVERIES OF MAIN ELECTRICAL ENGINEERING PRODUCTS (£ MILLION)

	Year	1st Qtr.	2nd Qtr.	3rd Qtr.	4th Qtr.
Rotating electrical machines	1960	31.5	34.6	29.3	38.8
	1961	33.0	38.7		
Transformers for lighting, heating and power	1960	11.1	10.0	10.4	11.5
	1961	11.2	12.1		
Switchgear and control gear	1960	29.1	28.1	27.7	30.9
	1961	32.2	32.9		
Other electrical machinery	1960	5.1	4.7	4.4	4.9
	1961	6.0	5.5		
Insulated wires and cables	1960	33.2	33.5	30.0	35.4
	1961	36.4	39.1		
Domestic electrical appliances	1960	33.1	30.6	30.9	36.8
	1961	32.5	33.4		
Electrical equipment for motor vehicles, cycles and aircraft	1960	15.7	17.4	15.0	14.9
	1961	14.1	18.7		
Primary batteries	1960	3.1	3.1	3.6	4.3
	1961	3.8	3.3		
Secondary batteries (accumulators)	1960	6.6	6.4	6.0	7.2
	1961	6.2	6.7		
Electric lamps	1960	5.8	5.0	5.2	6.5
	1961	6.4	6.0		
Other electrical goods (except radio, telecommunication and other electronic apparatus)	1960	21.2	20.4	19.7	24.1
	1961	22.8	23.6		

INDUSTRIAL NEWS *[continued]*

## New Sheffield Service Centre

THE new head office and service centre of the No. 3 (Sheffield) Sub-Area of the Yorkshire Electricity Board in Change Alley is an imposing building faced in white Portland stone and containing seven floors, the top three of which accommodate the Commercial Department, Accountancy Department and the executive offices. On the mezzanine floor there are a demonstration theatre and conference rooms.

The main selling floor consists essentially of an entrance foyer and subsidiary sales floor through which people pass to pay accounts or to go to the main sales floor. The foyer is, in fact, a small sales floor in itself, so that the impact of electrical appliances is made as soon as the consumer enters the building. It also contains a "quick sale" counter where a consumer can buy lamps, plugs or fuses, etc. Beyond this point, the consumer passes downwards to pay accounts or ascends two or three steps to the main sales floor.

The lighting of the main selling floor and the accounts hall has been designed to be architecturally pleasing and at the same time provide the intensity of lighting required by the new Code of Practice. Both floors derive their main lighting from illuminated ceiling panels and the illuminated ceiling of the selling floor in particular presents a combination of the functional and aesthetic. The entrance floor combines indirect fluorescent lighting with high intensity spotlights to give a soft yet sparkling

effect. The total lighting load is of the order of 150 kW.

Heating is by underfloor electric cables and the opportunity has been taken to install three different systems. Two floors have withdrawable type installations—Thermoduct and Pan-elec, respectively—and on the other floors a solidly embedded system is used. Periphery insulation is used on the intermediate floors with full underfloor insulation on the top floor.

Samples of the various types of floor heating employed are shown under a thick toughened glass panel in the Industrial Display Section, so that consumers can inspect the installation. The total heating load is 450 kW and the supply is provided during off-peak periods.

The building is extensively equipped with socket outlets for accounting machines and general purposes and is wired for remote dictation machines. Use has been made of the "Dialled Despatch" vacuum tube system for the transmission of documents and small articles, a complete circuit of the building taking only 37 seconds.

## R.E.C.M.F. Exhibition at Stockholm

NEXT Monday the fourth Swedish exhibition of radio and electronic components, instruments and gramophone equipment, organised by the Radio and Electronic Component Manufacturers' Federation, will be opened in Ostermans Marmorhallar, Birger Jarlsgatan 18, Stockholm, by the British Ambassador. It will remain open until Friday, 13th October. This will be the largest and most comprehensive exhibition yet organised abroad by the Federation, and 10,000 invitations have been circulated throughout Scandinavia and other northern countries. Iliffe Electrical Publications, Ltd., will have a stand and other exhibitors include the following:—

Amphenol-Borg, Ltd.; Associated Electrical Industries, Ltd.; Bakelite, Ltd.; Beckman Instruments, Ltd.; Belling & Lee, Ltd.; Sydney S. Bird & Sons, Ltd.; A. F. Bulgin & Co., Ltd.; Cannon Electric (Gt. Britain), Ltd.; Colvern, Ltd.; Dawe Instruments, Ltd.; Electrolube, Ltd.; Electronic Components,

Ltd.; English Electric Co., Ltd.; Enthoven Solders, Ltd.; Formica, Ltd.; Garrard Engineering & Manufacturing Co., Ltd.; Goodmans Industries, Ltd.; Hellermann, Ltd.; Hughes International (U.K.), Ltd.; A. H. Hunt (Capacitors); Linton & Hirst, Ltd.; London Electrical Manufacturing Co., Ltd.; McMurdo Instrument Co., Ltd.; Morganite Resistors, Ltd.; Mullard, Ltd.; Multicore Solder, Ltd.; M-O Valve Co., Ltd.; N.S.F., Ltd.; Painton & Co., Ltd.; Parmeko, Ltd.; Plessey Co., Ltd.; Rola Celestion, Ltd.; Standard Telephones & Cables, Ltd.; Steatite & Porcelain Products, Ltd.; Technograph Electronic Products, Ltd.; Telcon Metals, Ltd.; Texas Instruments, Ltd.; and Thorn Electrical Industries, Ltd.

### Radio and Television Servicing Awards

The City and Guilds of London Institute has accepted an offer from Philips Electrical, Ltd., to present "Philips Awards," each consisting of a service kit, to the three candidates judged to be the most meritorious in the Institute's final examinations in radio and television servicing, beginning with the 1962 examinations.



Front view of the main Change Alley entrance of the new head office and service centre of the Yorkshire Electricity Board's Sheffield Sub-Centre. Right: The chairman of the Board, Mr. D. Bellamy, C.B.E., D.L., and Alderman J. W. Sterland, M.B.E., J.P., Lord Mayor of Sheffield and a part-time member of the Board, inspect the premises before the official opening ("Sheffield Telegraph and Star" photo)

## TRADE ANNOUNCEMENTS

The Domestic Appliance Division and the Electrical Appliance Division of **Allied Ironfounders, Ltd.**, have moved into a new three-storey building in Cadbury Road, Sunbury-on-Thames, Middlesex (telephone: Sunbury-on-Thames 5577). The new building has a conference room, a staff dining-room and a kitchen specially designed and fitted out by the company's Catering Equipment Division. The company's London headquarters and showroom remain at 28, Brook Street, W.1; the offices in Orchard House have been given up; and those at 18, Dering Street will still house the Catering Equipment Division and Export Department, for which increased accommodation will now be available.

**Atlas Lighting, Ltd.**, and **Ekco-Ensign Electric, Ltd.**, announce price reductions, effective from 2nd October, for their "Super Slim" popular pack fluorescent fittings. The 5ft 80 W "Slickstart" is reduced from £4 19s 2d to £4 16s, and the 4ft 40 W "Slick start" from £4 2s 2d to £3 19s. The 8ft 125 W "Switchstart" is reduced from £7 6s to £7 2s. These prices include the tubes and purchase tax, and certain other reductions have been made in the prices of "Super Slim" popular pack attachments.

On 9th October new branch premises are being opened by **S. N. Bridges & Co., Ltd.**, at 52, West Nile Street, Glasgow, C.2. The ground floor consists of a spacious showroom and reception counter, while the mezzanine floor accommodates the manager's office, general offices and a full range of tools for demonstration purposes. On the lower ground floor there is a fully equipped modern repair and service workshop and stores.

**The Plessey Co., Ltd.**, has granted an exclusive licence to the Centralab Division of **Globe Union, Inc., U.S.A.**, to manufacture, sell and use in the United States moulded track potentiometers made to Plessey designs. The Centralab Corporation has also been granted a non-exclusive licence to make, use and sell these potentiometers in Canada, and Central and South America.

**Euco Tools, Ltd.**, have moved to Armfield Close, Industrial Estate, West Molesey, Surrey (telephone: Molesey 2066).

The Newcastle-upon-Tyne area sales office of **Alcan Industries, Ltd.**, has been moved to new premises at

Newgate House, Newgate Street, Newcastle - upon - Tyne (telephone: Newcastle-upon-Tyne 22107). The Telex number, 21917, remains unchanged.

Sonatest ultrasonic non-destructive testing equipment is now marketed in the United Kingdom exclusively by **Research & Control Instruments, Ltd.**

**Elcontrol, Ltd.**, have concluded an agreement with the Siegler Corporation Magnetic Amplifiers Division,

New York, for the exclusive sale and manufacture of Elcontrol products in the United States and Canada.

**Mr. K. H. Vernon** has been appointed lamp and lighting representative for North Wales under the Liverpool branch of **Philips Electrical, Ltd.** He succeeds Mr. G. T. Jones who is now branch manager at Liverpool.

The Glasgow branch of the **Reliance Telephone Co., Ltd.**, a G.E.C. subsidiary, has moved to 123-145, North Street, Glasgow, C.3 (telephone: Central 7377).

## OUTPUT AND SALES IN AUGUST

THE latest returns of electricity output and sales issued by the Ministry of Power and the Electricity Council are for the month of August. Most of the Boards record smaller increases than usual and in one case—the Midlands Board—sales dropped 2.5 per cent below the figure for the corresponding month of 1960. On the other hand, expansion continued at a high level in Scotland, especially in

the south, where 13.7 per cent more electricity was sold than a year ago, compared with an average rate of 13.2 per cent for the twelve months.

Plant installed at the end of August aggregated 30,738 MW and included a 200 MW English Electric set with a 1,400 klb/hr International Combustion boiler brought into service during the month at the C.E.G.B. power station at High Marnham.

ELECTRICITY GENERATED AND SENT OUT FOR PUBLIC SUPPLY

	Fuel consumed Thousand tons			kWh generated Millions			kWh sent out Millions	Output capa- city MW
	Coal	Coke and Breeze	Oil	Steam	Water power	Total		
Central Electricity G.B. ... ...	3,206	53	373.2	7,627	12	7,643	7,165	27,945
North of Scotland H.E.B. ... ...	2	—	1.1	3	177	185	184	1,045
South of Scotland E.B. ... ...	247	—	0.6	460	18	478	449	1,748
Total for August, 1961 ... ...	3,455	53	374.9	8,090	207	8,306*	7,798	30,738
Corres. total for August, 1960 ...	3,429	55	353.8	7,860	122	7,992	7,502	28,570
Inc. or dec., per cent ... ...	+0.8	-3.6	+6.0	+2.9	+70.1	+3.9	+3.9	+7.6
Total to date, 1961 ... ...	33,879	561	3,564	78,726	1,868	80,706	75,905	
Total for corrs. 8 months, 1960 ...	31,618	612	3,377	73,508	1,630	75,231	70,796	
Inc. or dec., per cent ... ...	+7.1	-8.3	+5.5	+7.1	+14.6	+7.3	+7.2	

\* The total figure includes generation by other methods amounting to 9 million kWh.

ELECTRICITY SENT OUT BY BOARDS FOR THEIR CONSUMERS

Board	Totals for August (million kWh)			Twelve Months' Totals Ended 31st August (million kWh)		
	1960	1961	Inc. or Dec.%	1960	1961	Inc. or Dec.%
London ... ...	525.5	547.4	+ 4.2	8,561.4	9,299.5	+ 8.6
South Eastern ... ...	401.4	431.2	+ 7.4	6,028.9	6,613.2	+ 9.7
Southern ... ...	556.2	580.2	+ 4.3	7,980.2	8,924.8	+ 11.8
South Western ... ...	274.3	289.9	+ 5.7	3,709.4	4,101.9	+ 10.6
Eastern ... ...	661.2	678.3	+ 2.6	9,603.8	10,510.2	+ 9.4
East Midlands* ... ...	576.1	581.3	+ 0.9	7,985.3	8,727.6	+ 9.3
Midlands* ... ...	705.3	687.8	- 2.5	10,528.0	11,430.6	+ 8.6
South Wales* ... ...	424.6	427.9	+ 0.8	5,831.1	6,191.4	+ 6.2
Merseyside and N. Wales* ...	461.8	491.3	+ 6.4	6,197.2	6,849.7	+ 10.5
Yorkshire* ... ...	758.4	779.8	+ 2.8	10,252.2	11,676.5	+ 13.9
North Eastern* ... ...	422.7	427.2	+ 1.1	5,857.9	6,437.5	+ 9.9
North Western* ... ...	769.8	812.2	+ 5.5	10,250.9	11,367.7	+ 10.9
Total all Area Boards ... ...	6,537.3	6,734.5	+ 3.0	92,786.3	102,130.6	+ 10.1
Direct Supplies by C.E.G.B. ...	316.6	316.1	- 0.2	3,738.4	3,824.3	+ 2.3
Grand Total ... ...	6,853.9	7,050.6	+ 2.9	96,524.7	105,954.9	+ 9.8
Mainly Industrial Areas* ...	4,118.7	4,207.5	+ 2.2	56,902.6	62,681.0	+ 10.2
Mainly Non-Industrial Areas ...	2,418.6	2,527.0	+ 4.5	35,883.7	39,449.6	+ 9.9
South of Scotland E.B. ... ...	541.3	615.3	+ 13.7	7,631.9	8,638.1	+ 13.2
North of Scotland H.E.B. ...	123.5	136.8	+ 10.8	1,722.9	1,944.9	+ 12.9

\* Those in which industrial consumers took over 50 per cent of the total sales in the preceding financial year.

## NEW ELECTRICAL EQUIPMENT

### MINIATURE LAMPS

A further micro-miniature lamp, the Atlas "Micro-Lite," is to be marketed by the Special Products Division of THORN ELECTRICAL INDUSTRIES, LTD., Great Cambridge Road, Enfield, Middx. Available in four basic versions, the "Micro-Lite" is a small incandescent lamp designed for 1.2 or 1.5 V operation, from 10 to 30 mA. For special purposes a 0.8 V lamp is available with a current consumption of 6 to 8 mA. Due to the low current consumption the lamps are suitable for transistor operation. Light output from the 1.2 V lamp using a 10 mA supply is 50 milli-lumens. There are four types with overall lengths of 0.157, 0.137, 0.118 and 0.196 in excluding leads. Life expectancy for one type of lamp at 1.2 V a.c. is approximately 100 hr, but when operating on a d.c. supply this is increased by 50 per cent. Derated to 1 V, a life in excess of 1,000 hr may be expected. Two types can be supplied with a cap and lamp-holder, the complete assembly having an approximate length of 0.431 in.

### COIL CUTTER METERING

Coil cut-up lines made by PRESS EQUIPMENT, LTD., Hunters Vale, Birmingham, 19, are now available with an electro-mechanical metering and measuring device, which supersedes the conventional end stop and retracting run-out track. This device operates in conjunction with the straightening unit of the line, detects the amount of material passing through the out-going pinch rolls, and automatically stops the straightener and operates the shear when it has metered off the required length. It incorporates automatic re-set to provide instantaneous re-start of the

straightener and measure as the shear blades open. Setting of the length required involves the use of two dials, one for feet and the other for inches, the former requiring only a coarse setting. The accuracy on lengths up to 12 in is of the order of  $\pm 0.015$  in.

The illustration shows the device fitted to a 36 in wide by 0.048 in coil cut-up line with decoiling unit incorporating power-driven pinch rolls to draw the material off a mandrel mounted between roller bearings, the speed of the pinch rolls being automatically governed by a Heenatron variable speed drive controlled from a catenary detector between the decoiler and straightener. This drive operates through a magnetic transducer, a.c./d.c. electronic excitation unit, tachometer generator, and d.c. geared motor, and provides a constant amount of material in the loop irrespective of varying consumption by straightener and shear. The line can handle aluminium strip down to 0.007 in thick.

### WANDER BUTTON SWITCH

The wander button switch introduced by DOWTY ELECTRICS, LTD., Tewkesbury, Gloucestershire, comprises a miniature push-button switch, fitted in a neoprene rubber case designed for comfortable hand operation. It is enclosed in the rubber moulding in a manner which minimises the risk of accidental operation. The switch incorporates a positive detent action and is available with a wide variety of two pole make-and-break contact arrangements. The unit is designed to operate in temperatures ranging from  $-65^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  at altitudes up to 60,000 ft, switching 5 A at 28 V d.c. with a resistive load. Terminations are provided in the form

of trailing leads enclosed in "Superflexit" conduit, the length of which may be varied to suit individual applications, and should be specified when ordering.

### UNIVERSAL SEAM WELDER

The "Speedseam 50" universal seam welding machine is a general purpose equipment introduced by SCIAKY ELECTRIC WELDING MACHINES, LTD., Falmouth Road (Trading Estate), Slough, Bucks., and is usually supplied with longitudinal and circumferential seam welding attachments, and equipped with electronic timing control. This is a compact timing panel giving synchronous pulsation control and is equipped with a phase-shift heat unit, allowing stepless adjustment of the welding current.

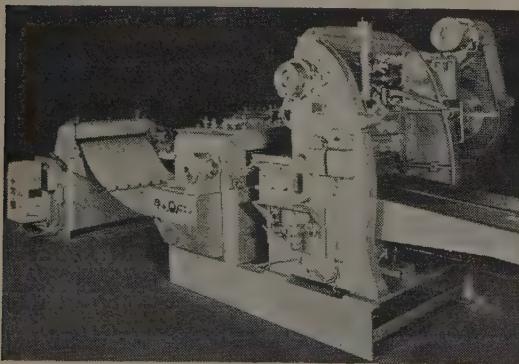
Pressure-tight seam welds in mild steels up to 18+18 gauge are produced, and various electrode assemblies can be mounted to give good clearance on the lower arm assembly, which is adjustable for height. A range of weld speeds from 3 to 18 ft per min can be selected by electronic d.c. motor control.

It is also available as a dual purpose model, capable of carrying out seam welding and spot welding operations. The equipment can be provided with circumferential and longitudinal seam welding assemblies and upper and lower spot welding adaptors. In this case the electronic control panel employed gives optional selection of seam welding or spot welding.

The top seam welding bearing assembly can be rapidly detached and the appropriate spot welding horseshoe and electrode shank holder replaced, also the lower bearing assembly can also be replaced by a conventional round copper spot welding arm mounting standard electrode shanks. In this form, the machine can weld mild steels up to 0.160+0.160 in and light alloys of the non-heat-treatable type up to 0.048+0.048 in. The timing control gives "cool" and "weld" times of 1-90 cycles.

### POWER AND SERVICES OUTLET

The I.S.O. Series I unit produced by INDUSTRIAL SERVICE OUTLETS, LTD., 127, High Street, Croydon, Surrey, is designed to supply essential services,



Left: Press Equipment metering device used on a 36 in wide aluminium strip cut-up line



Dowty wander button switch



Left : Industrial Service Outlets  
100 A three-phase flush power supply outlet  
Below : Measuring Instruments (Pullin), Ltd., hermetically sealed instrument



such as electricity, compressed or chilled air, water, telephone, etc., to such places as airport aprons without impeding the movement of aircraft and other vehicles. It consists of a main cover fitting flush to the ground beneath which is a plug and socket. The cover has an automatic spring opening action which brings the socket to the correct angle for easy insertion of the plug, and releases a cable lay cover securing bolt. Closing the main cover brings the plug and socket back to the horizontal, which in turn makes the plug depress the cable lay flap to form a sloping platform for the cable.

The unit is designed for a 415 V, three-phase supply, from 30 to 150 A, and incorporates flameproof equipment. All floor level plates and covers are castings stressed and tested to bear a wheel load of 125 p.s.i. with a safety factor of 2.

#### HERMETICALLY SEALED INSTRUMENTS

A range of hermetically sealed platform scale instruments weighing  $2\frac{1}{2}$  oz, with a scale length of  $1\frac{1}{4}$  in and a viewing distance of 18 in, has been brought out by MEASURING INSTRUMENTS (PULLIN), LTD., Electrin Works, Winchester Street, Acton, W.3. The cases of the series 125 instruments, which are of black anodised aluminium to keep weight to the minimum, have an outside diameter of approximately 1.77 in and provide a sealed compartment for dry nitrogen at normal pressure. The scale presentation has graduations and figuring generally in line with the new draft British Standard AB (INE) 1661. A platform scale has been added to overcome parallax error and to increase the clearance between the pointer and the dial so that under severe vibration the pointer does not touch the sub-dial.

The instruments are "non-fogging" even after rapid reduction in temperature. The limiting temperature range for moving coil instruments is  $-40$  to

$+85^\circ$  and for rectifier voltmeters it is  $-40$  to  $+55^\circ\text{C}$ . The series 125 instruments can be supplied for d.c. voltage (50 mV-250 V), a.c. voltage (2.5 V up to 250 V) and as ammeters for d.c. current (50  $\mu\text{A}$  up to 5 A). The preferred scale ranges are 0-10, 15, 20, 30, 40, 60, 80 and decimal multiples.

#### POLYSTYRENE CAPACITORS

A range of miniature polystyrene capacitors for normal working voltages of up to 50 V d.c. and designed for transistorised and low voltage circuit applications is now available from the TELEPHONE MANUFACTURING CO., LTD., Capacitor Division, Sevenoaks Way, St. Mary Cray, Orpington, Kent. Capacitance values are from 0.0005 to 0.5  $\mu\text{F}$  with a closest standard tolerance of  $\pm 1.0$  per cent. Sizes of individual capacitors range from  $\frac{1}{16}$  in (length) by  $\frac{1}{16}$  in (diameter) to  $1\frac{15}{32}$  in by  $2\frac{25}{32}$  in. The insulation resistance is 750,000  $\text{M}\Omega$  or 250,000 ohmsfarad, whichever is the smaller, and the power factor is not greater than 0.001 at 1 kc/s.

#### GENERAL PURPOSE OSCILLOSCOPE

The portable oscilloscope model 381 announced by DARTRONIC, LTD., 3/7, Windmill Lane, London, E.15, incorporates a tube giving a 3 in display. The vertical amplifier has a sensitivity of 100 mV r.m.s./cm, a bandwidth from



Dartronic model 381 oscilloscope

d.c. to 9 Mc/s ( $-3$  dB) and a rise time of 0.06  $\mu\text{sec}$ . The overshoot is less than 1 per cent and the input impedance is  $1\text{ M}\Omega$  shunted by 20 pF. The input attenuator is frequency compensated in nine switched stages from 0.1 to 50 V r.m.s./cm, and an additional control provides continuously variable adjustment between the fixed steps. A calibration voltage of 10 V r.m.s. at mains supply frequency is available at a front-panel socket.

A free-running Miller time-base is employed, controlled in nine switched steps augmented by a continuously variable control. Ranges are available from 0.12-3 c/s to 80.0-420 kc/s. Fly-back is suppressed on all ranges. The trace may be expanded to at least seven screen diameters, sufficient X shift being provided to view a completely expanded trace throughout its whole length. The input to the horizontal amplifier may be applied via a front panel socket. A time base output is available at a front panel socket, the amplitude being 28 V peak-peak, negative going. The trace may be synchronised internally, or externally via a front panel socket. The instrument operates from a.c. mains, 200-250 V, 50-100 c/s, but models for operation from 110 and 200-250 V can be supplied. The power consumption is 95 W.

#### DIGITAL VOLTMETER-COUNTER

The combined digital voltmeter, frequency meter, time interval meter and clock pulse source introduced by SOUTHERN INSTRUMENTS, LTD., Instrumentation Division, Frimley Road, Camberley, Surrey, measures from 1 mV to 500 V, 0.1 c/s to 120 kc/s using a count period of 0.1, 1 or 10 sec, and intervals, defined by electrical signals or contact closures, of 1 msec to 27.7 hr. Also it provides crystal controlled clock pulses of 0.1, 1 and 10 msec, and 0.1, 1 and 10 sec. On all functions the input impedance is high.

A combined function and range selector switch is provided, and a



Southern Instruments type M.1155 digital voltmeter-counter

bright display with a wide viewing angle is achieved with projection type in-line indicators. A latching system, which is released momentarily at the end of each count, provides a continuous display that is uninterrupted by the counting period. The instrument is mains powered and portable.

### ULTRASONIC THICKNESS GAUGE

The transistorised ultrasonic thickness gauge type 1103 developed by DAWE INSTRUMENTS, LTD., Harlequin Avenue, Great West Road, Brentford, Middx., is suitable for work which requires non-destructive measurement of material thickness in places to which there is access to one side only. A direct meter indication of thickness is given and the material selector switch gives immediate readings with steel, aluminium and copper. Other materials, including most metals, glass, plastics and ceramics, can be tested by using the undesignated switch position and calibrating on a known thickness of the material. Measurement can be made within the range 0.09in to 5in to accuracies between 3 and 5 per cent.

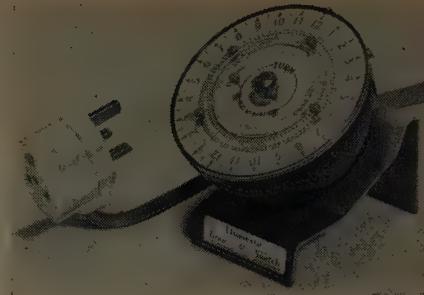
The equipment consists of an all-transistor oscillator which generates frequencies variable between 2 and 4 Mc/s. The piezo-electric transducer converts the waveform into mechanical vibrations and transmits them into the workpiece. The vibration frequencies are varied by the oscillator tuning dial,

and the frequencies at which resonance occurs in the workpiece are found by noting the accompanying increases in the headphone audio signal and in the output meter deflection. In a given material the resonant frequencies are directly related to the thickness, and values from 0.09in to 5in can be read directly on the indicating meter.

The standard flat surface transducer is suitable for use on flat, cylindrical and compound curved surfaces down to 2in overall diameter or 12in internal diameter. Concave transducers are available for use on smaller convex surfaces. A battery check is provided on the indicating meter, and the typical battery life is 80 hr continuous operation, or 2 to 4 months of normal use.

### DOMESTIC TIME SWITCH

A time switch suitable for domestic use has been introduced by SANGAMO WESTON, LTD., Enfield, Middlesex. It is housed in an attractive moulded polystyrene case mounted on a metal bracket, which can be used as a stand or for hanging from a single bracket on a wall or skirting board. The switch is provided with a lead to which is attached a 13 A 3-pin, or alternatively a 15 A 3-pin, plug adaptor. In use, all that is necessary is for the adaptor to be plugged into the power point and the plug on the appliance to be inserted in the adaptor. A warning light appears on the rim of



Sangamo Weston model S302 domestic time switch

the time switch when the appliance is "on." It has a large easy-to-read dial and the minimum time between consecutive "on" and "off" operations is 30 min.

Six pins are supplied with each time switch and for "on" setting a pin is inserted at the required time shown in a red ring on the dial. For "off" setting another pin is inserted in a similar way in a green ring. For immediate "on" or "off" a red button on the side of the appliance is depressed. To switch on or off at other times it is necessary to put in extra pins. Spare pins may be stored in the centre of the dial. The maximum load of the time switch is limited by the plug and is approximately 3 kW.

The appliance is suitable for use on a 200/250 V supply, a.c. only, and the price is £5 19s 6d.

## Fluorescent Lighting Fittings

EASE of installation, by the incorporation of new design features, is one of the principal attributes of the "Slim Jim" range of fluorescent lighting fittings introduced by the Lighting and Heating Group of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. These are neat batten fittings for 8ft 125 W, 5ft 80 W, 4ft 40 W and 2ft 20 W lamps. They are obtainable for single or twin lamps with the exception of the 4ft size which is

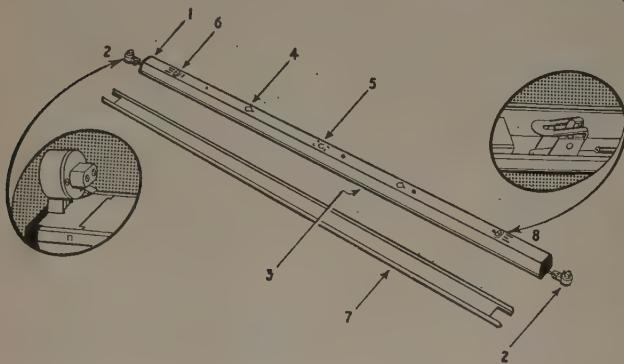
single-lamp only. They are supplied in packaged form with warm-white tubes.

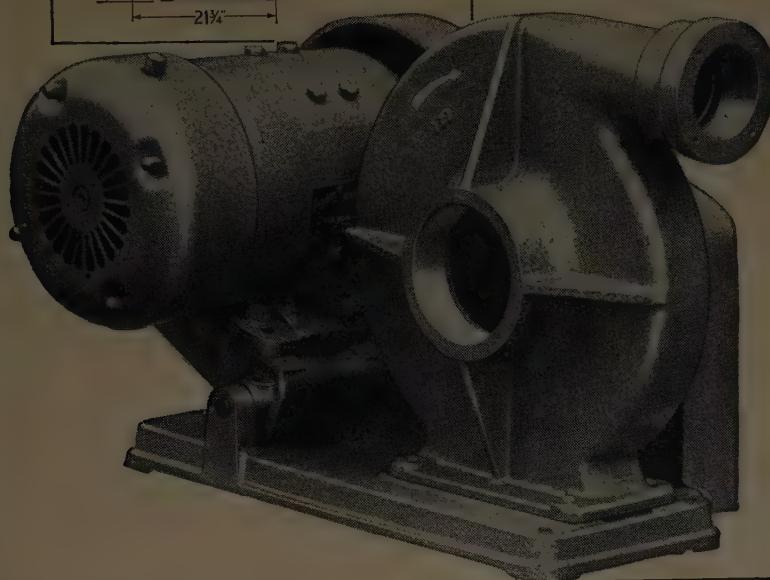
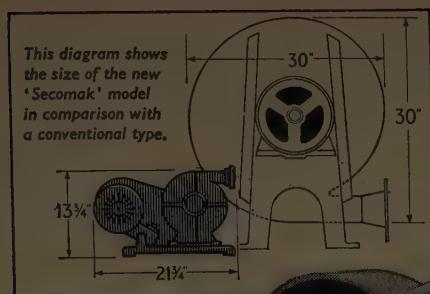
In all of the fittings spring-loaded lampholders slide in grooves into the operating position and thus enable the lamps to be inserted from either end. They are held in position by the cover plate; no fixing screws are needed and immediate positive earth contact is ensured. There are keyhole slots for direct ceiling mounting; holes for conduit suspension; and wire loops for

chain suspension. When the channel cover is secured in position by a single-spring catch it is automatically earthed. Newly-designed snap-start control gear is provided for the 4ft and 5ft fittings.

To go with the new batten there are a number of stoved-enamel reflector and Diakon diffuser attachments which are easily mounted or detached by virtue of a snap-fit catch. The prices of the new fittings are claimed to be keenly competitive.

Left : G.E.C. "Slim Jim" fluorescent batten fittings. 1. Black spring-loaded metal end caps. 2. Retractable holders at both ends. 3. Ample cable cleats for neat wiring. 4. Keyhole fixings for direct ceiling mounting. 5. Masking plate for central conduit box. 6. Holes for conduit suspension. 7. Cover plate. 8. Reflector catch. Below: One of the attachments : Perspex closed-end reflector for single-tube batten





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It is fitted with an automatic belt tensioner to maintain correct driving tension, preventing slip on starting, giving longer life to high strength nylon belt and simplifying fitting of a new belt.

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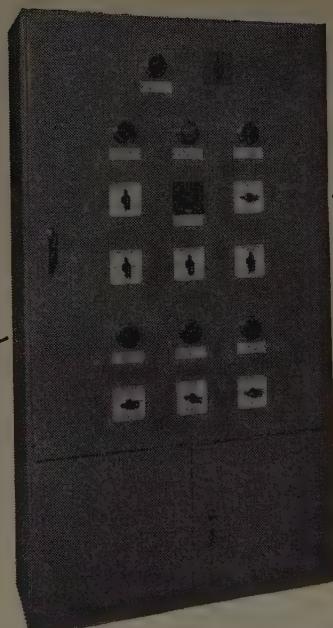
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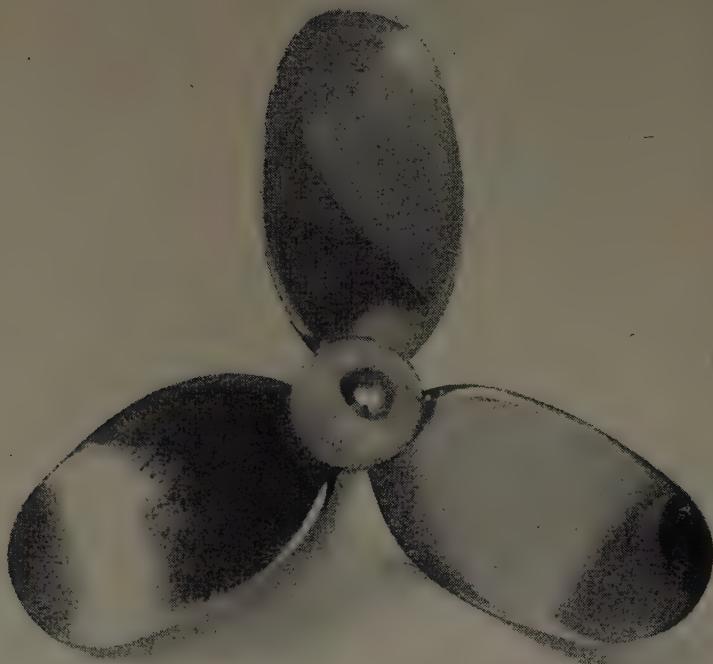
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**Technical details.** These Brentford Regulators, which provide stepless regulation, work from an input of 6,600 volts, 3 phase, 60 cycles, and the output is arranged to increase the voltage with load by 15 volts between phases from no load to full load.

Brentford Transformers Ltd., Manor Royal, Crawley, Sussex. Tel: Crawley 25121. A member of the GHP Group

BRENTFORD B

# Public Lighting Engineers

## Colour and Efficiency Discussed at Scarborough Conference

"No hope of efficient schemes of uniform lighting of traffic routes can be entertained unless costs of lighting are administered in the same way as those of roads and education." In stating this in his presidential address, Mr. E. C. Lennox, M.I.E.E., F.I.E.S. (manager, Wear Sub-Area, North Eastern Electricity Board) added that the operation of street lighting would as far as possible be left in the hands of the local authorities.

Mr. Lennox reminded his audience that in his presidential address in 1936 he had drawn attention to the need for a new form of legislation to meet the national requirement for adequate street lighting. Since then he had been joined by many advocates who had emphasised that the street lighting legislation did not meet the problems of the day and that in the interests of economy, efficiency and safety of all road users some reorganisation should not be further delayed. Not only was there a multiplicity of lighting authorities, but in 75 per cent of cases there was a total inadequacy of financial resources to carry out their functions satisfactorily. Though conurbation committees had been formed to obtain greater co-operation between lighting authorities, progress was slow and no suggestion had been made about levelling the cost of providing uniform lighting.

To improve the traffic route lighting over the whole area of a typical county and maintain it to present Code of Practice standards would require additional rating of less than 1d in the £ in the county boroughs and the absurd figure of 18s or more in the £ in the parish areas. If the costs were amalgamated under one administration the total rate for the whole area would be an average of less than 1d in the £. Thus the richer corporations would pay their full share of the costs of providing and maintaining lighting—lighting made necessary only by their own traffic usage.

### Night Driving on Motorways

On the need for lighting motorways, Mr. Lennox pointed out that there were nearly twice as many accidents after dark as during daylight hours and the accidents were more serious. To enable drivers travelling at 70 m.p.h. to see objects 1,000ft ahead in clear weather would in theory require headlights with an intensity 40 times that of the present normal type. On motorways abroad, where the density of traffic was higher than on our present motorways, the installation of lighting had been followed by a reduction of the accident rate after dark.

Mr. Lennox said that it was his opinion (and that of many who had studied the problem of roadway lighting) that fixed lighting on motorways would be worthwhile expenditure in (a) preventing accidents, and (b) increasing the use of the motorway during dark hours, with (c) consequent reduction of night-time traffic on alternative "all purpose" roads. The cost of lighting a motorway would be £4,000 a mile against a total cost of construction of

£250,000 a mile and £3,000 a mile for anti-glare screens that were not entirely satisfactory.

### Choice of Lamp

In his paper "New Lamps—or Old? A Comparative Survey of the Electric Lamps used Out of Doors," Mr. H. Hewitt, M.I.E.E., F.I.E.S. (Atlas Lighting, Ltd.) said that many factors determined the choice of lamp, and this choice was not easy for the public lighting engineer whose decision irrevocably involved a large public expenditure for many years ahead. They must try not to forget the old in welcoming the new.

From a detailed study of economics of four categories of established lamps Mr. Hewitt said all the comparisons emphasised the better value of the integral sodium lamp over the orthodox pattern, and of the colour-corrected mercury lamp over the uncorrected type. Where colour rendering was not so important, as on main traffic routes, the high efficiency of the 200 W sodium lamp was obviously of great advantage, and only a large reduction in the cost of the 400 W MBF/U mercury lamp would make it a possible alternative for these roads. Where better colour rendering was desirable, however, particularly in residential roads, the fluorescent tube was a good alternative to sodium, chiefly because the overall efficiencies of the lower ratings of sodium lamp did not compare with those of the higher ratings. For minor roads, the incandescent lamp was shown to give poor overall value, which stresses once again the false economy involved in choosing equipment with the lowest initial cost.

### Future Developments

Looking at the new developments, Mr. Hewitt said that it seemed that the only possible field in public lighting for the high-loaded fluorescent tube was in floodlighting. There was, however, a possibility that higher efficiency might be obtained from the fluorescent tube at the expense of colour rendering. There was no need to go green, as previously suggested. The author thought the orthodox colours of the fluorescent tube were a good proposition, particularly if the lantern designers could rise to the challenge.

Though there were still operating difficulties to be overcome, the quartz iodine lamp was now at the stage when they should consider whether it might have some applications in street lighting. A case could be made for a 100 W lamp with a life of 2,000 hours when compared with other sources giving up to 3,500 lm/point, and Mr. Hewitt thought such a small source would stir the lantern designer to new ideas. The use of the quartz iodine lamp as a ballast for the mercury vapour lamp to produce a new type of "mercury tungsten" lamp of good colour qualities and life was an interesting idea but it was difficult to make out a good case for such a lamp on economic grounds unless it was relatively low in price—

and this seemed unlikely. An interesting new development for floodlighting was the aperture fluorescent tube which, with a suitable reflector, could produce a flat beam of light of high intensity.

### Colour Characteristics

Provision of ample light economically is the main function of street lighting although to the layman colour is an outstanding characteristic. In their paper "Colour is no Bar" Messrs. J. T. Grundy and G. K. Lambert, A.E.I. Lamp & Lighting Co., Ltd., discussed how colour sensation arises from luminous radiation and how it is specified, a distinction being made between colour appearance and colour rendering. The radiation characteristics of modern street lighting lamps were examined and discussed from the point of view of their use in city centres, shopping areas, traffic routes and residential areas.

Loss of colour contrast with sodium light, they said, was offset by reduced glare from the lanterns and an enhancement in the brightness contrast by which objects at a distance were seen. Together with the higher intensities economically practicable this made the new high light output sodium lamps unequalled for traffic route lighting.

Where shop window and other lighting provided some colour for the pedestrian, sodium could still be used, its colour appearance being improved where necessary by blending. Where considerations of amenity made good colour desirable, the tubular fluorescent lamp was unequalled, colour-corrected mercury being an acceptable compromise.

With its high efficiency of light generation, long life and suitable size and brightness for light control in a street lantern of reasonable size, the sodium lamp was unequalled for traffic route lighting. Because of changes in human vision over a wide brightness range, its colour, which at first sight would seem to bar its use, turned out to be less glaring at lantern brightnesses and to give greater clarity of vision at road brightnesses. For the motorist the resulting confidence in seeing in a good installation far outweighed the initial disadvantages of unaccustomed colour. During the past 15 years the use of the 140 W lamp had become widespread in the United Kingdom and certain other countries where the initial objections to colour had been overcome and its advantages discovered by experience. The new 200 W size made economic the higher intensities of lighting warranted by modern traffic.

In street lighting colour appearance of lanterns was probably more important than colour rendering at the lower brightnesses of the road scene. The appearance of sodium light could be improved by adding blue-green fluorescent light.

Where good colour amenity was needed, the tubular fluorescent lamp was unequalled. Modern slim lanterns had possibly less light control than the former deep lanterns which caused adverse comment of their daytime appearance. With the newer lamps of high loading, and possibly with reduced spacing, the higher intensities required could be achieved. Colour-corrected mercury lamps were taking the place of the mercury lamp in new installations, and provided a satisfactory compromise.

Mr. E. B. Sawyer, F.I.E.S. ("Some Social and Economic Aspects of Street Lighting") said that the social and economic aspects of street lighting were in-

extricably mixed in so far as the community was concerned if not for the individual. The amenity value of street lighting could not be presented in a balance sheet. It was as a national benefactor that the economics became more precise, for road vehicles, which yielded in taxes not less than £657 million a year, were enabled to operate with greater safety and efficiency.

Mr. Sawyer also supported the lighting of motorways and added that the standard of lighting for every traffic route on which the traffic reached the Ministry of Transport design capacity should be such that it ensured no greater strain on the driver and no greater uncertainty to the pedestrian than during the hours of daylight. Even recent installations, he said, had generally been based on 1937 practice. The time had also come to face up to the lighting requirements of modern road surfaces. The benefits of increased light output from a given input of energy, in increased efficiency of control of light and in the minimum increase of costs of basic energy (well below the increases of other costs) should be utilised to raise the standard of lighting and not merely used to save annual costs.

### Ten-Year Forecast

Looking to the future, Mr. Sawyer said that they would expect that within the next 10 years all trunk roads in urban and many in rural areas would be lighted all night to a standard of 18,000 to 20,000 lamp lumens per 100ft linear, say, 5,000 miles in all. Ninety per cent of Class 1 roads in urban and 40 per cent in rural areas would be lighted to a slightly lower standard with another 5 per cent of trunk and Class 1 roads in rural areas, say, 12,000 miles, to about the standard of the present Group A lighting and finally some 33 per cent in all of other roads with electric lighting considerably better than was generally found in residential areas today. To achieve this would cost something like £115 million and the annual cost at present values would rise to a little over £46 million.

Mr. Sawyer showed that, in general, public lighting was costing more in actual cash but less in terms of the increased income of the ratepayers, and less in relation to certain local services of apparently equal importance. These figures suggested, he said, that a 20 per cent increase in the rate for public lighting would not be disproportionate and a 50 per cent increase would be more certain to ensure a sound economic return for the ratepayer, especially if the lighting of through roads did not have to be included.

The consumption of electricity for a lighting system such as Mr. Sawyer advocated would be of the order of 2,000 million kWh per annum. This figure agreed with the consumption in 10 years' time assuming that the present rate of growth continued. But traffic density was increasing at a similar rate so that there was a danger that we would remain permanently in the present unsatisfactory and dangerous state.

Good lighting alone, Mr. Sawyer added, could be responsible for a reduction of the present bill for casualties, damage and loss of time by about £60 million per annum, a sum that was less than the estimated average annual cost of the standard of lighting advocated. Local authorities were already spending nearly £30 million per annum on lighting, and if this were doubled, the whole programme would be completed in about four years.

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- Cover screw is captive.
- Fuse clips are of heavy gauge phosphor bronze heavily silver plated to offer minimum contact resistance, thereby reducing temperature rise.
- The fuse, to B.S.1362 type C, is ASTA certified for rating.

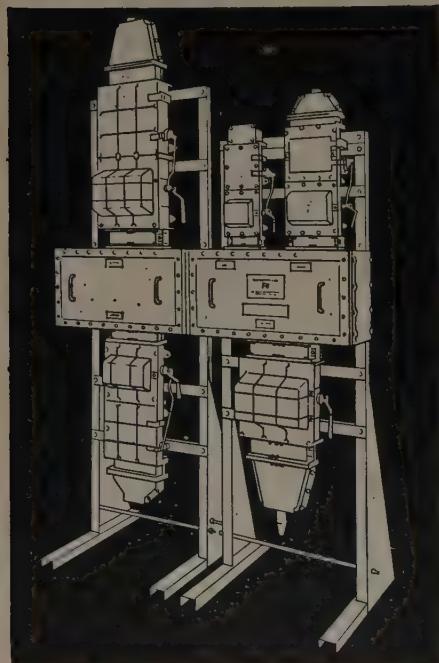


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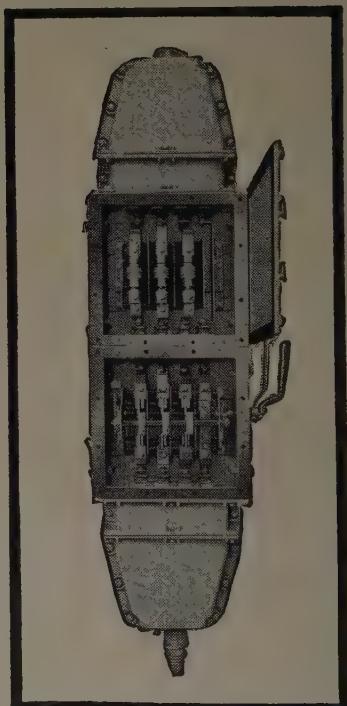
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## DISCHARGES ON INSULATING MATERIALS

THE Electrical Research Association's report Ref. L/T382 deals with the effects of small discharges on some insulating materials at temperatures up to 250°C. Two earlier reports in this series dealt with the effects of such discharges on insulating materials under room conditions and at reduced pressure respectively. The report considers the elucidation of modes of dielectric breakdown by discharges, at temperatures up to 250°C; the evaluation of some materials for use in the presence of discharges at these temperatures; and the appraisal of a possible standard industrial test for assessing the relative resistances of moulded insulation to the impact of discharges.

The discharge inception voltage for the rod plane system used decreases with increase in temperature especially for those materials whose permittivity increases rapidly with temperature. The discharge magnitude at the inception voltage, for dried-out samples, decreases as the temperature is increased to 150°C, although for a given applied voltage it remains substantially the same or increases by a factor of two or three. There is no significant increase in the loss angle of the dielectric due to the occurrence of discharges above 100°C. Breakdown initiated by surface micro-cracks caused by discharges impinging on a strained moulding is shown to be a limitation of life. There may be advantage from an electrical point of view in using the minimum moulding pressure consistent with

production requirements and, if necessary, post-stoving to anneal the materials when they have to be used in applications requiring good discharge resistance. In the case of alkyd materials the breakdown of the bond between resin and glass fibre fillers gives rise to comparatively poor resistance to discharges at high temperatures.

Of the materials so far tested in flow cup form, the fast curing mineral-filled alkyds have the longest life at high temperatures, and their use is suggested for applications not requiring a high impact strength. Of the stronger glass fibre filled materials, the dough moulding compounds are superior with the possible exception of the epoxide material which has only been tested at 155°C so far. At 155°C the epoxide mouldings have the longest life of all the glass fibre filled materials, but the heat-sensitive pigment is rapidly attacked by the products of discharges. Melamine materials are unsuitable for use at 155°C in applications requiring good discharge resistances. The flow cup discharge resistance test used is to be presented as a tentative standard test for the resistance of moulded insulation discharges.

The report—"The Effects of Small Discharges on Some Insulating Materials: III. At Temperatures up to 250°C," by N. Parkman, Ref. L/T382—is obtainable from the Electrical Research Association, Cleeve Road, Leatherhead, Surrey, price 15s, postage 8d.

## MINING EXPLOSIONS MEMORANDUM

A MEMORANDUM prepared by a technical committee of the Association of Mining Electrical and Mechanical Engineers commenting on various aspects of the report produced by a sub-committee of the C.I.N.C.C.\* dealing with mining explosions, is published in the September issue of the Association's journal the *Mining Electrical and Mechanical Engineer*. The Association's committee feel that equipment cannot at present be obtained to comply with the suggestion that apparatus should be designed to afford suitable electrical protection against danger from incendive sparking if it is damaged. Present control methods cannot switch off the supply sufficiently fast to prevent ignition. It is suggested that gas detectors be developed to monitor an area and automatically electrically isolate that area on the sensing of a predetermined percentage of gas. Recommendations are made to reduce the risk of incendive arcing by the careful siting of electrical apparatus and the provision of mechanical protection.

Makeshift arrangements for protecting cables during shot firing are agreed to be unsatisfactory and a recommendation is made that standard forms of protective unit be devised and a code of practice for their use issued. It is thought that greater emphasis might have been laid on the dangers resulting from damaged trailing cables, which are added to by the increasing number of mechanised coal faces and the higher operating speeds of machines.

The committee also feel that steps could be taken to

improve the effectiveness of earth-leakage and overload protection systems used in mines. At present, the neutral point of the power transformer in most earth-leakage systems is directly connected to earth. A major contribution to safety would be the introduction of earth-leakage protective equipment responding to fault currents of the order of milliamperes in systems where the maximum fault current is limited. Meanwhile, it is recommended that impedances should be inserted in all solidly earthed neutral systems to restrict fault currents. Many over-current protection equipment failures are due to incorrect fluid being used in the inverse time limit dashpot and criticism is made of the variation in fluids found both between manufacturers and between equipments produced by a single manufacturer. An attempt should be made to specify a standard fluid and to produce suitable dashpots.

## DIESEL-ELECTRIC TRACTION

A course of eighteen lectures on diesel-electric traction is to be held at the Poplar Technical College, London, E.14, on Wednesday evenings (7 to 9 p.m.) commencing on 4th October. It is intended to review diesel-electric traction practice in this country and refer to railway development. The course is designed for those engaged in electric traction who have a technical knowledge of Ordinary National or equivalent standard. The course fee is £1 10s.

\* Coal Industry National Consultative Council.

## Financial Section

### STOCKS and SHARES

SEVERAL of our industrial giants, in issuing progress reports on their results for the first half of the current year, have related the increasingly common experience of sales maintained at satisfactory levels in comparison with last year's, but of earnings materially reduced by the pressure of rising production costs upon profit margins. In the case of Imperial Chemical Industries the sales figures were almost level with the first six months of 1960, but net profits after tax were more than 25 per cent lower, giving at this rate rather disconcertingly narrow cover for the present rate of dividend. Coming on the heels of A.E.I.'s warning about final dividend prospects for 1961, and the sharp fall in Vickers' half-yearly figures, the I.C.I. announcement was held largely responsible for a further fall in industrial share prices to the lowest average points of the year.

#### Dull Markets

Under the influence of the company's dividend warning, Associated Electrical Industries shares fell by a further 3s over the week to 29s 9d. Shares of the other major electrical groups remained unsettled but held their prices comparatively well. B.I.C.C. lost 1s 9d to 55s 9d and Chloride Electrical Storage 5s to 7s 5d, while elsewhere Decca, Thorn Electrical and a number of other electrical shares were affected by the generally downward drift in industrials. Plessey at 38s 6d lost 1s 6d of their previous improvement while awaiting the issue of the formal merger offer to Ericsson and Automatic Telephone. Hoover jumped to 52s 6d but reverted to 50s after the denial of rumours (which have recurred at intervals since last year's Ford Motor deal) about a bid from the American parent company for the outside shareholdings. Once again it was left to Dimplex and Berry's Electric to add some bright points to the sombre appearance of the market.

#### E.M.I. Results

Financial results of Electric & Musical Industries for the year ended in June were roughly in line with expectations, and there was not much change in the price of the 10s shares at 36s. They offer a yield of a little under 5 per cent on the 17½ per cent dividend, which is the same as for last year and

applies to capital increased as a result of the acquisition of Morphy-Richards and Ardente. These new members made a comparatively small contribution to the improvement of about £100,000 in the group net profit. Since the latter was the outcome of a £13½

million expansion of sales, it provides a further illustration of the trend in profit margins.

#### Reliance-Clifton

A one-for-two scrip issue has been distributed by Reliance-Clifton Cables

### Price Changes in

Company or Board	Nom. Value	Middle price 2nd Oct.	Week's Rise or Fall	Dividend		Yield %	1961	
				Pre- vious	Last		High- est	Low- est
Gilt-edged Stocks								
Brit. Elec. 1968/73	... 100	71		3	3	4 4 6	75½	70½
Brit. Elec. 1974/77	... 100	66		3	3	4 11 0	70½	64½
Brit. Elec. 1976/79	... 100	68½		3½	3½	5 2 3	73½	67
Brit. Elec. 1974/79	... 100	75½		4½	4½	5 12 6	82	75
Brit. Elec. 1967/69	... 100	87		4½	4½	5 3 6	91½	86
Overseas Electric Supply								
Calcutta Elec.	... £1	21/3	+3d	7†	7†	11 11 0	23/3	20/6
East African Power	... £1	13/-	-9d	8	10	15 7 9	15/-	13/-
Nigerian Elec.	... £1	18/-	+1/6	10	14	15 11 0	19/9	15/6
Perak Hydro-Elec.	... £1	21/3		10	10	9 8 3	23/6	17/6
Electrical Shares								
Aberdare Holdings	... 5/-	14/9		17½	17½	5 18 9	17/-	14/3
Aerialite	... 1/-	4/9		54	54	11 7 0	8/-	4/6
Allen, W. H.	... £1	28/3	-6d	14	10*	7 1 6	42/6	28/3
Allied Insulators	... 5/-	8/9	+3d	20	10*	5 14 3	10/-	8/-
Alwyn Holdings	... 5/-	21/3		12½	15½*	3 10 6	22/3	16/6
Anglo-Portuguese Tel.	... £1	20/-		9	9	9 0 0	25/-	18/9
Arcolectric	... 1/-	4/9		15	15	3 3 3	6/-	3/9
Aron Meters	... 5/-	20/-		15	15	3 15 0	20/-	17/-
Assoc. Elec. Ind. Ord.	... £1	29/9x.d.	-3/-	15	15	10 1 6	48/6	29/6
Automatic Tel. & El.	... 5/-	16/9	-3d	17	17		20/-	12/9
Babcock & Wilcox	... £1	23/9	-1/6	9	9	7 11 6	36/6	23/9
Bakelite	... 10/-	46/3		17½	17½*	3 15 9	60/-	42/-
Baldwin, H. J.	... 2/-	1/-		10	Nill		1/9	1/3
Berry's Electric	... 5/-	57/6	+3/9	30	33½*	2 17 6	57/6	37/-
Bowthorpe Holdings	... 2/-	7/9		18½	22	5 13 6	10/3	7/9
Brit. Elec. Resistance	... 2/-	6/9	-3d	17½	17½*	5 3 9	8/9	6/6
Brit. Elec. Traction:								
Def. Ord. "A"	... 5/-	48/6	-1/9	40	50	5 3 0	57/6	41/9
British Electronic Ind.	... 5/-	10/9		—	15	6 19 6	15/3	8/9
B.I. Callender's	... £1	55/9	-1/9	13½	13½	4 16 9	62/3	49/6
B.I. Callender's 6% Pref.	... £1	16/6		6	6	7 5 6	18/3	16/6
British Thermostat	... 5/-	33/-		20	27½	4 3 3	40/-	28/-
Brook Motors	... 10/-	52/6		25	25*	4 15 3	55/-	47/-
Bulgin, A. F.	... 1/-	12/3		55	40*	3 5 3	13/3	7/9
Bulpitts	... 5/-	17/9		15	16½	4 11 6	27/6	16/9
Burco Dean	... 5/-	6/6		18	15	11 10 9	11/9	6/3
Cable & Wireless	... 5/-	16/-	-1/3	10	10*	3 2 6	19/9	12/6
Cambridge Instruments	... 5/-	32/-		12½†	22	3 8 9	38/6	30/-
Chloride El. Storage "A"	... £1	75/-	-5/-	17½	20	5 6 9	91/-	72/-
Clarke Chapman	... £1	38/3		13½	13½	7 3 9	54/-	37/6
Clarke, T.	... 2/-	4/-		16	16	5 6 9*	5/3	3/6
Combined Elec. Mfrs.	... 4/-	7/-		—	12½	7 2 9	10/-	6/9
Contactactor Switchgear	... 5/-	13/-		14	14	5 7 9	16/-	12/9
Cossor, A. C.	... 5/-	7/3		Nil	Nil		8/-	5/6
Crabtree	... 10/-	24/-		20	12½*	5 4 3	33/9	24/-
Crompton Parkinson	... 5/-	11/9	-3d	14	12½*	5 6 6	14/6	11/3
De La Rue	... 10/-	51/3	-1/9	22½	22½*	4 7 9	70/-	51/-
Decca "A"	... 10/-	58/9	-2/-	20	23½	3 19 6	70/-	52/3
Desoutter	... 5/-	56/3		30	35	3 2 3	68/9	49/-
Dewhurst	... 2/-	5/6		20	20	3 12 9*	6/6	3/9
Dictograph Tel.	... 2/-	10/6		20	20*	3 16 3	13/-	8/6
Dimplex	... 5/-	85/6	+1/9	30	35*	2 1 0	85/6	47/-
Dubilier Condenser	... 1/-	2/3		30	15*	6 13 3	3/-	2/-
Duport	... 5/-	11/-	-3d	17½	20	6 1 0*	17/-	11/-
E.M.I.	... 10/-	36/-	-9d	17½	17½	4 17 3	51/3	35/3
Eleco	... 2/-	8/-		20	20*	5 0 0	10/6	4/3
Electrical Apparatus	... 5/-	18/-		14½	20	5 11 0	21/-	17/-
Electrical Components	... 5/-	8/9		11½	12½	7 2 9	9/9	7/9
Elec. Construction	... £1	23/6	+1/-	9	5	4 5 0	39/-	20/3
Elliott-Automation	... 5/-	33/3	-6d	9·3	13	1 19 3	37/6	25/6
Enfield Rolling Mills	... £1	38/-		15	15	7 18 0	51/6	38/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

\* After scrip issue.

† Free of income tax.

‡ Dividend indicated.

and Industrial Products, and in their new form the 5s shares have been quoted around 18s 9d, with the new "A" (non-voting) shares at 17s 6d. Shareholders have been advised not to regard the issue as implying a larger dividend distribution, so that on the

basis of this year's 20 per cent dividend, scaled down in proportion to the increase in capital, the yield is below average at less than 3½ per cent. There was, however, more than threefold cover for the last payment, and in each of the past three years dividends have

been materially supplemented by tax-free payments out of capital profits. In the latter connection it is noted that quoted investments appearing in the balance sheet at £1.33 million had in December a market value fully half a million higher. In June the chairman reported a satisfactory level of activity.

## Electrical Investments

Company or Board	Nom. Value	Middle price 2nd Oct.	Week's Rise or Fall	Dividend		1961			
				Pre-vious	Last	Yield %	High-est	Low-est	
<b>Electrical Shares—continued</b>									
English Electric	...	£1	27/6	—9d	10	10	7 5 6	40/9	27/6
English Electric 3½% Pref.	...	£1	9/9		3½	3½	7 13 9	11/9	9/9
Ericsson	...	5/-	28/6	—9d	13†	13†	—	32/-	22/3
Ever Ready	...	5/-	37/6	—6d	20	22½	3 0 0	40/-	31/6
Falk Stadelmann	...	£1	21/9		10	7½	6 18 0	26/-	21/9
G.E.C.	...	£1	26/-	—3d	10	10	7 13 9	39/6	26/-
G.E.C. 6½% Pref.	...	£1	16/6		6½	6½	7 17 6	19/3	16/6
General Cables	...	5/-	4/9		15	Nil	—	6/3	4/9
G.H.P. Group	...	£1	21/-		6	7½	6 13 3	24/6	17/-
Goblin (B.V.C.)	...	5/-	4/6		12½	10	11 2 0	8/6	4/3
Hackbridge Holdings	...	5/-	6/-		20	10*	8 6 9	6/9	5/-
Harland Engineering	...	5/-	12/9	—6d	16	16	6 5 6	19/-	12/9
Head Wrightson	...	5/-	22/6		14	16	3 11 0	30/-	22/-
Heatrae	...	2/-	14/-	+3d	12½	25	3 11 6	19/-	12/6
Holophane	...	5/-	14/9	+3d	26	30	10 6 9	20/6	14/6
Hoover	...	5/-	50/-	+2/-	90	45*	4 10 0	55/6	37/6
Hunt, A. H.	...	4/-	17/6		20	20	4 11 6	25/9	17/6
Intl. Combustion	...	5/-	23/3		30	30	6 9 0	33/9	23/3
Intl. Computers & T.	...	£1	91/6		10	11½	2 9 3	107/-	59/-
Johnson & Phillips	...	£1	21/6		Nil	5	4 13 0	24/-	17/6
Kenwood Mfg.	...	1/-	4/-		—	—	—	6/-	4/-
Laurence Scott	...	5/-	14/3		15	15	5 5 3	18/9	14/3
Lister, R. A.	...	£1	50/-		14	14	5 12 0	56/9	45/6
Lucas, J.	...	£1	52/6	—6d	12½	13½	5 4 9	71/6	52/6
Marryat & Scott	...	2/-	16/9		27½	32½	3 17 6	18/6	13/9
Mather & Platt	...	£1	37/6		11	11	5 17 3	51/6	37/6
Metal Industries	...	£1	52/6	—3/-	15	15	5 14 3	66/6	50/-
Midland Elec. Mfg.	...	£1	56/6	—1/6	12	12	4 5 0	67/6	56/6
Murex	...	£1	39/6	—1/6	20	13*	6 11 3	51/6	39/3
Newman Ind.	...	2/-	7/-		12½	15	4 5 9	7/6	5/-
Oldham & Son	...	1/-	2/9		17½	17½*	6 7 3	3/-	2/3
Parsons, C. A.	...	£1	48/6x.d.	—9d	9½	12½	5 3 0	72/6	46/9
Philips' Lamps	...	£1	200/-		16	16*	1 12 0	£13½	£9½
Plessey	...	10/-	38/6	—1/6	17	15½*	3 18 0	45/-	35/3
Pullin Group	...	2/-	10/9	—6d	25	25	4 13 0	15/-	10/9
Pyrotenax	...	5/-	41/3x.c.		40	45	4 2 0*	48/9	34/9
Radiation	...	£1	24/-		12	10	8 6 9	37/6	23/6
Reliance-Clifton	...	5/-	18/9		15	20	3 11 6	22/-	14/9
Reynrolle	...	£1	38/6	—9d	17½	9½*	5 1 3	51/6	36/6
Richardsons Westgarth	...	10/-	4/3		8½	Nil	—	8/3	4/3
Sangamo Weston	...	10/-	21/9		13½	10½*	4 12 0	25/9	18/9
Scott, James	...	5/-	30/-		25	27½	4 11 9	32/-	25/6
Simon Engineering	...	5/-	37/6		—	27½	3 13 3	43/9	28/-
Smith (England), S.	...	4/-	14/6		17½	20	5 10 3	23/9	14/6
Southern Areas	...	£1	17/6		5	6	6 17 3	23/-	14/6
Strand Elec.	...	5/-	17/9	—6d	14½	20	5 12 9	20/-	12/3
Sturtevant	...	5/-	9/6	—9d	15†	13†	11 4 0	18/6	9/6
Sun Elec.	...	5/-	15/-		15	18½	6 3 3	17/6	15/-
T.C.C.	...	10/-	41/3		35	22½*	5 9 0	43/9	40/-
Telephone Rentals	...	5/-	26/3		15	15½*	2 17 3	29/6	18/6
Thompson (John)	...	5/-	13/9		20	5	—	16/9	13/9
Thorn Elec.	...	5/-	55/-	—1/-	25	25	2 5 6	63/-	44/6
Thornycroft	...	4/-	5/6	+6d	6	6	—	7/-	5/-
Tube Investments	...	£1	60/3	—3/6	—	14	4 12 9	85/-	60/3
Ultra Electric	...	5/-	23/9	—9d	20	25	—	31/3	12/6
Walsall Conduits	...	4/-	10/3	—3d	15	15	5 17 0	15/-	10/3
Ward & Goldstone	...	5/-	28/9		35	17½*	3 0 9	36/6	25/6
Watford	...	2/-	7/-		25	20*	5 14 3	10/9	6/9
Westinghouse	...	£1	29/6	—1/-	11	11	7 8 6	45/-	29/6
West, Allen	...	5/-	10/9	—3d	12½	13½	6 5 6	14/6	10/3
Wilkins & Mitchell	...	5/-	8/9		21	12	6 17 3	15/3	8/9
Wolf Electric	...	5/-	13/6		12½	13½	5 1 9	17/6	13/6

### Dimplex Prospects

Having risen to 83s 9d on the strength of the company's 79 per cent increase in net profits in 1960-61, the 5s shares of Dimplex were advanced still further to 85s 6d, after the appearance of the chairman's review of further prospects. He made no definite predictions at this stage, but told shareholders that the company was off to a good start in the current year. Demand for the products was growing at such a rate that plans for the development of new factory sites were being pushed forward. He confirmed that the increase in the dividend from the equivalent of 25 to 35 per cent would have been substantially larger but for the Chancellor's appeal for restraint. The new rate is covered four times by earnings and produces a yield of just over 2 per cent.

### Ether Issue

The 1½ million new 5s shares issued by way of rights to shareholders of Ether Langham Thompson are now fully paid-up, and will remain available free of transfer stamp duty until the end part of this month. They have been dealt in lately around 19s 3d and offer a yield of 3½ per cent on the 12½ per cent rate of dividend indicated for the year just ended. In deciding against any increase on the 1959-60 rate the directors are deferring to the Chancellor's wishes on the subject. The amount of about £750,000 raised by the issue is needed for an enlargement of production facilities.

### Nigerian Electricity

Being influenced to a large extent by the state of the local tin-mining industry earnings of the Nigerian Electricity Supply Corporation have shown some wide swings over the years, but the dividend record has been consistently good and in the light of the latest accounts a yield of 15½ per cent on the £1 shares at 18s is difficult to explain without reference to considerations outside the company's own performance. In the latest year the prosperity of the tin industry was reflected in rises of 61 per cent in sales, and of 47 per cent in revenue. Requirements of the Government-owned Electricity Corporation, to whom the company supplies electricity in bulk, are expected to rise by about 15 per cent annually over the next decade.

## REPORTS and DIVIDENDS

**Electric & Musical Industries, Ltd.**—Total group sales expanded from £68.7 million to £82.4 million and with profit, before tax, up by £100,000 at £5.4 million the dividend is maintained at 17½ per cent on increased capital with an unchanged final of 12½ per cent. Profit margins were lower.

During the year the ordinary stock was increased by £2,187,000 to £11,244,000 by the allotment of 4,374,000 ordinary 10s shares as part of the purchase consideration for Morphy-Richards, Ardente and Ardente Acoustic Laboratories. The group profit, before tax, includes £278,000, representing the profits earned by these subsidiaries since the dates of their acquisition last September.

The increase of £510,000 in the charge for depreciation includes £238,000 in respect of Morphy-Richards and an additional £149,000 from the revaluation of U.K. freehold properties on the basis of current replacement values.

The increase in interest charges was due to increased working capital requirements, and to financing part of the cost of acquiring Morphy-Richards.

The lower profit margins, the directors say, were caused mainly by the restrictive economic policies of the Governments of the U.K. and Australia which affected adversely the domestic appliance and radio and television businesses. In addition, substantial expenditure was incurred on the rationalisation of the domestic appliance business of the Gramophone Co. with that of Morphy-Richards.

**Pifco Holdings, Ltd.**—Referring to the current year ending 30th April, 1962, Mr. A. D. Webber, chairman, says turnover in the first four months shows a satisfactory increase, but a forecast "may be unwise."

Turnover rose last year but margins were a little thinner. The rise in costs continues and competition is intensive, which means that selling prices cannot always be increased.

**A. C. Cossor, Ltd.**—Morgan Grenfell & Co., Ltd., announce that, in respect of their offer on behalf of the Raytheon Company for the whole of the issued capital of A. C. Cossor, Ltd., acceptances have been received in respect of over 87 per cent of the ordinary shares and 94 per cent of the preference shares. Raytheon have decided to accept the 87 per cent acceptances in respect of the ordinary shares in lieu of the 90 per cent referred to in the offer and have

declared both offers unconditional. In the meantime both offers remain open for acceptance.

Mr. C. F. Adams (chairman), Mr. R. E. Kraeve (president) and Dr. Carlo L. Calosi (vice-president) of the Raytheon Company have been elected to the board of A. C. Cossor. Major-General Sir Miles Graham continues as chairman and Mr. J. S. Clark as managing director. Raytheon have already announced their intention of preserving the identity of the Cossor group.

**Bruce Peebles-Belmos Merger.**—In a letter to shareholders, Mr. Thomas Coughtrie (chairman of both companies) says the businesses of Bruce Peebles and Belmos are complementary in their respective range of products, and there has been built up over the years a friendly and close relationship between them. The combination of electronic and rectifier activities with control equipment and instrumentation is entirely in line with modern trends, and a closer relationship between the various research activities of the two companies will lead not only to economy but also to a more rapid development of new products, processes and techniques and a better deployment of sales effort.

On current trading prospects of Bruce Peebles, it is stated that since the last chairman's statement the benefits from the expansion programme and works reorganisation are increasingly apparent and that the improved trend which was evident early this year has continued. Output to date is higher than for the corresponding period of last year; despite this higher output the total value of orders which are on hand shows some increase over the figure as at the end of last year. Although profit margins in this section of industry continue to be narrow, the unsatisfactory trend of trading results of last year has at this date not only been halted but reversed and so far as can be reasonably foreseen this satisfactory trend will now continue. At this stage it is not practicable to make any forecast of the results for the current year ending 31st December, 1961, but the directors are satisfied that the company is now operating at a profit. Only one-quarter of Belmos annual profits will be included in the group profits available for distribution in respect of the current year.

Trading profits of Belmos fell in 1959 when the group, while engaged in new product development, experi-

enced the combined effects of the 1957-58 recession in the capital industries and a drastic reduction in the business placed by the National Coal Board. The recovery in business in 1959 and 1960 was not reflected in the profits for 1960, but the full effect will be more apparent in the results for the current year, it being estimated that such profits before taxation will be not less than £150,000. All sections of the group are running at a high level of capacity and immediate prospects are very satisfactory.

**Plessey Merger.**—The formal documents for the proposed merger of the Plessey Co., Ltd., Automatic Telephone & Electric Co., Ltd., and Ericsson Telephones, Ltd., have now been posted to shareholders. Based on the present order books of the three companies, the directors expect that the manufacturing resources will be fully employed over the next twelve months.

Group profits of Plessey are estimated at £4.1 million for the year ended 30th June, 1961, compared with £4.39 million in 1959-60, and the directors anticipate that the 1961-62 profit should be as good as that of the year just ended. Pre-tax profits of Ericsson for 1961 are estimated to be not less than the 1960 figure of £1,086,650, while those of A.T.E. for the same period are expected to be somewhat higher.

If the merger becomes effective, Mr. A. F. Roger, chairman of A.T.E., and Sir Harold Wernher, chairman of Ericssons, will join the Plessey board.

**Electrical Components (Holdings), Ltd.**—At the annual general meeting last week the chairman, Mr. L. S. Seccombe said: "So far the 'little Budget' has not caused any trouble—in fact, sales for the first five months of the current year were up on the corresponding period of last year."

**Cambridge Instrument Co., Ltd.**—Third interim dividend of 4 per cent (the same), making 12 per cent to date.

**Drayton Controls, Ltd.**—Interim dividend 7½ per cent (the same).

### Meetings of Creditors

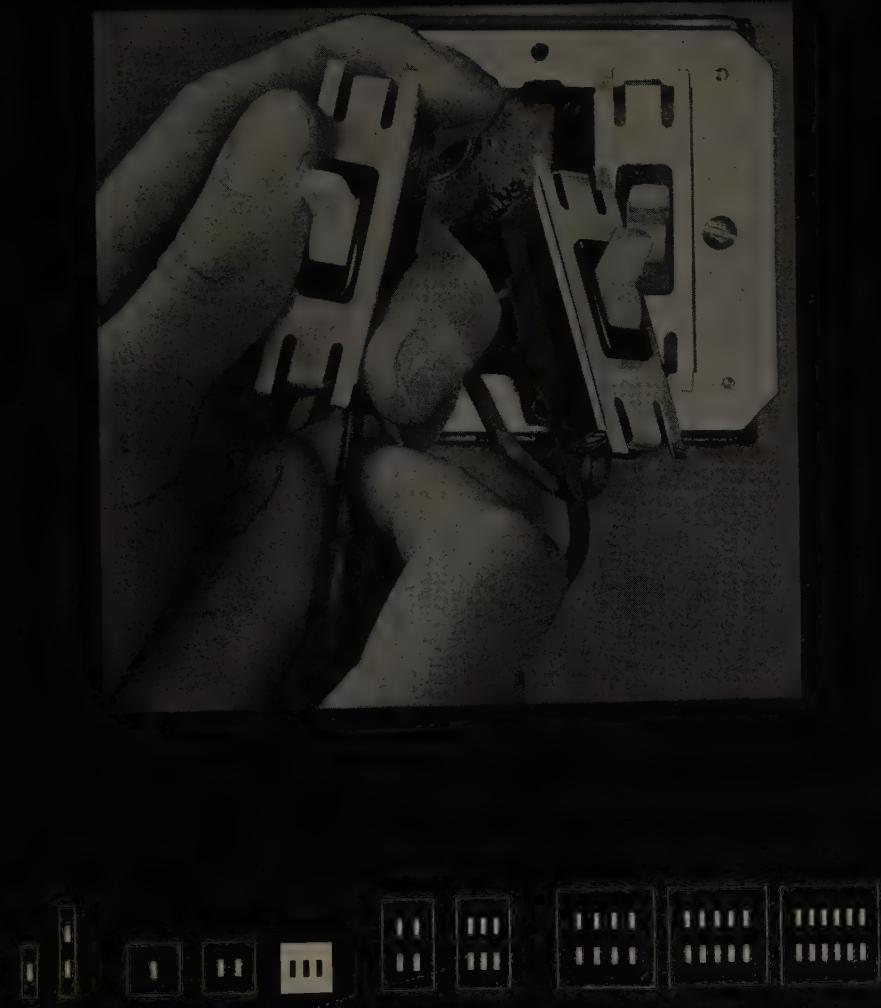
**Durham Electrical (Wholesalers), Ltd.**—Meeting of creditors at the Bonnington Hotel, Southampton Row, London, W.C.1, on 18th October for the purposes mentioned in sections 294/5 of the Companies Act, 1948.

**Radiomestic Appliances, Ltd.**—Meeting of creditors at Bank Chambers, 1, John Street, Bedford Row, London, W.C.1, on 12th October for the purposes mentioned in Sections 294/5 of the Companies Act, 1948.

### Bankruptcy

**L. Probert**, 31, Monks Brow, Barrow-in-Furness, Lancs., radio and electrical goods dealer.—Last day for receiving proofs for dividend 11th October. Trustee, Mr. D. Atkinson, 14, Lowther Street, Carlisle.

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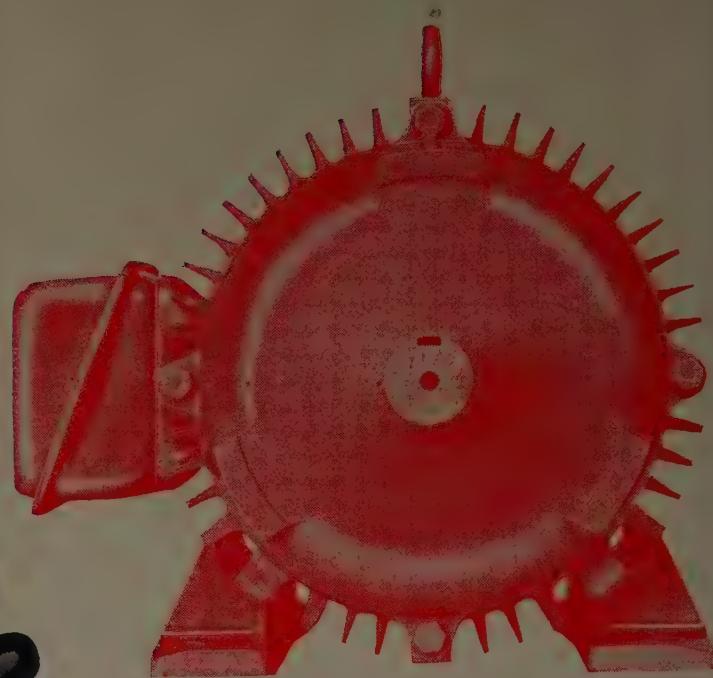
5 amp 1 way S.P.  
15 amp 1 way S.P.  
5 amp 1 way D.P.  
5 amp 2 way S.P.  
5 amp 2 way & off  
5 amp intermediate  
5 amp 1 way secret  
5 amp 2 way secret  
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## NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 243a, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

## MONDAY, 9th OCTOBER

**Arborfield** (Berks).—Unit Cinema, R.E.M.E., 7 p.m. I.E.E. London Graduate and Student Section, Arborfield District. Chairman's address, "Experimental Techniques Developed for Determining the Performance of Fuel Elements in Nuclear Reactors," by C. F. Price.

**Birmingham**.—College of Advanced Technology, Gosta Green, 6 p.m. I.E.E. South Midland Centre, Supply and Utilisation Group. "The Design of Housing Estate Distribution Systems using a Digital Computer," by R. L. Grimsdale and P. H. Sinclair.

**Cardiff**.—South Wales Institute of Engineers, Park Place, 6 p.m. I.E.E. Western Centre. Chairman's address by T. Gil.

**Glasgow**.—Royal College of Science and Technology, 6 p.m. I.E.E. South West Scotland Sub-Centre, Electronics and Measurement Group. Chairman's address, "Applying Electronic Engineering to Abstracts," W. H. P. Leslie.

**Halifax**.—Griffin Hotel, George Street, 7.45 p.m. A.S.E.E. Halifax Branch. "Solderless Connections," by A. S. Ferguson.

**Ipswich**.—Electric House, I.E.E., 6.30 p.m. I.E.E. East Anglian Sub-Centre. Chairman's address, "Telephones and the Future," by E. Hoare.

**Liverpool**.—Industrial Development Centre, Paradise Street, 6 p.m. I.E.S. Liverpool Centre. Chairman's address by N. Blackman.

**London**.—White Hall Hotel, Bloomsbury Square, 7.15 p.m. A.S.E.E. Central London Branch. "Electrical Supplies to the London Underground System," by D. F. Hudson.

**Manchester**.—Literary and Philosophical Society, 36, George Street, 6.45 p.m. Society of Instrument Technology, Manchester Section. "Instrumentation as an Aid to Fuel Efficiency," by R. Clare.

**Newcastle-on-Tyne**.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. Chairman's address by P. Richardson.

**Sheffield**.—Grand Hotel, 6.30 p.m. I.E.S. Sheffield Centre. Chairman's address by B. Ruston.

**Wembley**.—Century Hotel, 8.15 p.m. A.S.E.E. North West London Branch. "Diesel-electric Locomotives," by A. V. Stewart.

**Wood Norton, nr. Evesham**.—B.B.C. Engineering Department, 7 p.m. I.E.E. South Midland Centre. Malvern and District meeting. Annual general meeting followed by "Television Camera Tubes," by B. S. Pover.

## MONDAY, 9th to FRIDAY, 13th OCTOBER

**Sweden**.—Ostermans Marmorhallar, Birger Jarlsgatan 18, Stockholm. R.E.C.M.F. Stockholm Show.

## TUESDAY, 10th OCTOBER

**Basingstoke**.—Station Hotel, 8 p.m. A.S.E.E. Aldershot and Districts Branch. "Modern Cable Jointing."

**Belfast**.—Lecture Theatre LG25, David Keir Building, Queen's University, Stranmillis Road, 6.30 p.m. I.E.E. Northern Ireland Centre. Chairman's address, "Planning in the Electric Power Supply Industry," by W. Szwander.

**Birmingham**.—The Engineering Centre, Stephenson Place, 6.30 p.m. Institution of Heating and Ventilating Engineers, Birmingham and District Branch. "Aspects of Boiler Chimney Design to Avoid Corrosion and Smut Emission," by W. R. Carter.

**Bristol**.—R.W.A. School of Architecture, 6.30 p.m. Institution of Heating and Ventilating Engineers, South Western Branch. "Methods of Measurement," by J. M. Cooling.

**Cardiff**.—South Wales Institute of Engineers, Park Place, 7 p.m. I.E.E. Cardiff Graduate and Student Section. Chairman's address by G. C. Bosley.

**Catterick**.—School of Signals, Catterick Camp, 6.15 p.m. I.E.E. North Midland Centre. "Power from the Atom by Fission and Fusion," by K. W. Huddart.

**Chester**.—The Blossoms Hotel, 7.45 p.m. A.S.E.E. Chester and District Branch. "Industrial Application of Photo-electric Cells," by A. C. Stewart.

**Edinburgh**.—Carlton Hotel, 7 p.m. I.E.E. South East Scotland Sub-Centre, Electronics and Measurement Group. Chairman's address, "Applying Electronic Engineering to Abstracts," by W. H. P. Leslie.

**Glasgow**.—Charlotte Square, 7.30 p.m. Institution of Plant Engineers, Edinburgh Branch. "The Organisation of Preventive Maintenance," by D. C. Muirhead.

**Glasgow**.—South of Scotland Electricity Board, Kenilworth Hotel, 5, Queen Street, 8 p.m. A.S.E.E. Glasgow Branch. "Electrical Distribution."

**Gloucester**.—Royal Hotel, Station Road, 8 p.m. A.S.E.E. Gloucester and District Centre. "Flameproofness and Intrinsic Safety," by W. Bevan Whitney.

**Leicester**.—Westcotes Constitutional Club, 124, Wilberforce Road, 7.30 p.m. A.S.E.E. Leicester Branch. "Safety of an Electrical Installation," by F. E. Noakes.

**London**.—Connaught Rooms, W.C.2, 12.30 for 1 p.m. Electrical Industries Club. Luncheon.

**Grosvenor House**, Park Lane. Institute of Fuel. Annual dinner/dance.

**Savoy Place**, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. Chairman's address, "Trends in Computer Engineering," by W. S. Elliott.

**Royal Institution**, Albemarle Street, W.1, 6 p.m. Illuminating Engineering Society. Presidential address, "The Society's Contribution to Lighting Technology," by W. T. Souter.

**21, Bloomsbury Street**, W.C.1, 2.15 p.m. Society of Relay Engineers. "Television Distribution by Coaxial Cable," by G. J. Hunt and C. F. Whitbread.

**Manchester**.—Engineers' Club, 6.15 p.m. I.E.E. North Western Centre, Utilisation Group. Chairman's address, "Project Planning," by D. Marshall.

**Manchester** Literary and Philosophical Society's Rooms, George Street, 7.15 p.m. Institution of Plant Engineers, Manchester Branch. "The Trends and Progress of Nuclear Power Station Design," by W. G. Busbridge.

**Middlesbrough**.—Cleveland Scientific and Technical Institution, Corporation Road, 7.15 p.m. Ministry of Works. "Heating Buildings," by J. Clifford.

**Southampton**.—University, 6.30 p.m. I.E.E. Southern Centre, Electronics and Control Group. Chairman's address by E. Wolfendale.

**Stoke-on-Trent**.—North Stafford Hotel, 6 p.m. I.E.S. Stoke-on-Trent Group. "Stage Lighting," by B. Legge.

**York**.—Royal Station Hotel, 7.30 p.m. A.S.E.E. York Branch. "Modern Developments in Mechanical Power Transmission."

## TUESDAY, 10th and WEDNESDAY, 11th OCTOBER

**Wolverhampton**.—Wulfrun Hall. Conference on "Electricity in the Foundry."

## WEDNESDAY, 11th OCTOBER

**Birmingham**.—Engineering and Building Centre, Stephenson Place, 7.30 p.m. A.S.E.E. Birmingham Branch. "Industrial Application of Photo-electric Cells," by G. A. G. Ives.

**Bristol**.—School of Management Studies, Unity Street, 7 p.m. British Institution of Radio Engineers, South Western Section. "General Introduction to Inertial Navigation Systems," by E. Bristow.

**College of Science and Technology**, 7 p.m. I.E.E. Bristol Graduate and Student Section. Chairman's address by M. Paskins.

**Carlisle**.—Technical College, 7 p.m. I.E.E. North Eastern Centre. "Progress in Oil-Filled Cables and their Accessories," by A. N. Arman, F. J. Miranda and G. R. Bishop; and "The Influence of Ageing on the Characteristics of Oil-Filled Cable Dielectric," by P. Gazzana-Priaroggia, G. L. Palandri and U. A. Pelagatti.

**Exeter**.—Turk's Head Hotel, 8 p.m. A.S.E.E. Bristol and West of England Branch. "Protective Equipment for Industrial Plant," by Dr. W. L. Stern.

**London**.—Conway Hall, Red Lion Square, Holborn, W.C.1, 5.30 p.m. British Coal Utilisation Research Association. Tenth Coal Science Lecture, "The Position of Coal in Electric Power Generation," by L. Rotherham.

**Kent Room**, Caxton Hall, S.W.1, 6.30 p.m. Institution of Engineers-in-Charge. Presidential address by E. Griffiths.

**Mansion House**, 26, Portland Place, W.1, 6.30 for 7 p.m. Society of Instrument Technology, Control Section. "Process Control in Paper Mills," by H. B. Whitehouse and M. I. MacLaurin.

**Manchester**.—Engineers' Club, 17, Albert Square, 12.15 for 12.45 p.m. North Western Fuel Luncheon Club, Luncheon. Presidential address by D. P. Welman and annual meeting.

**Newcastle-upon-Tyne**.—Institution of Mining and Mechanical Engineers, Neville Hall, Westgate Road, 6 p.m. British Institution of Radio Engineers, North Eastern Section. "V.H.F. Communications Receivers and Transmitters using Transistors," by A. J. Rees or B. S. Cowle.

**Prince of Wales' Room**, County Hotel. I.E.S. Newcastle-upon-Tyne Centre. Lunchtime meeting and chairman's address by R. A. Hall.

**Norfolk**.—Red Lion Hotel, 7.30 p.m. A.S.E.E. East Anglia (Thetford) Centre. "Recent Developments in Fluorescent Lighting," by G. V. McNeill.

**Oxford**.—Demonstration Room, Southern Electricity Board, 37, George Street, 7 p.m. I.E.E. Oxford District. "The Developing Engineer," by J. E. L. Robinson.

**Preston**.—N.W.E.B. Demonstration Theatre, Friargate, 7.30 p.m. I.E.E. North Lancashire Sub-Centre. Chairman's address by F. Clegg.

**Rugby**.—College of Engineering Technology, 6.30 p.m. I.E.E. Rugby Sub-Centre. Chairman's address by K. J. R. Wilkinson.

## THURSDAY, 12th OCTOBER

**Blackburn**.—Municipal Technical College, 7.15 p.m. Ministry of Works. "Colour and Light in Buildings," by A. E. Hurst.

**Bradford**.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford and District Branch. "A New Approach to Traction Battery Charging," by D. Kirkby.

**Cardiff**.—Grand Hotel, I.E.S. Cardiff Centre. Chairman's address by G. J. Everett.

**Derby**.—Derby and District College of Technology, Kedleston Road, 7.30 p.m. Society of Instrument Technology, East Midland Section. "The Commonsense Approach to Instrument Manufacture," by C. E. T. Criddle.

**Dundee**.—Electrical Engineering Department, Queen's College, 6 p.m. I.E.E. North Scotland Sub-Centre. Scottish Centre chairmen's address by Professor E. G. Cullwick.

[Continued at foot of page 570]

## NEW PATENTS

## Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1956

36431. Lincoln Electric Co., Ltd.—D.C. generators. 28th November, 1957. (878242.)

1957

22297. National Research Development Corporation.—Inductor motors. 2nd July, 1958. (878319.)

33599. Babcock &amp; Wilcox, Ltd.—Large pressure vessels especially nuclear reactor vessels. 28th October, 1958. (878122.)

33742. Dunker, C., and Alexander, K.—Process for the manufacture of coreless rotors. 29th October, 1957. (878302.)

36376. Texas Instruments, Inc.—Electric switch mechanism. 21st November, 1957. (878342.)

37626. Westinghouse Electric Corporation.—Electric circuits incorporating static logic circuits. 3rd December, 1957. (878295.)

37732. Static multi-state circuits incorporating transistors. 4th December, 1957. (878296.)

38109. Stoops, A. L.—Manufacture of wound magnetic cores. 28th May, 1958. (878410.)

1958

317. Philips Electrical Industries, Ltd.—Transistor memory circuits. 3rd January, 1958. (878304.)

593. Burny Corporation.—Electrical connectors, and methods of making them. 7th January, 1958. (878154.)

2885. Junghans A.G., Geb.—Time switches. 28th January, 1958. (878339.)

4861. Garrard, F., and Siegenthaler, A.—Electromagnetic brake. 14th February, 1958. (878124.)

5850. Telefunken G.m.b.H.—Piezo-electric electro-mechanical transducers. 24th February, 1958. (878228.)

7108. Associated Electrical Industries, Ltd.—Thermocouples. 3rd March, 1959. (Cognate application 17203, 29th May, 1958.) (878083.)

10569. Licentia Parent-Verwaltungs-G.m.b.H.—Miniature electric motor. 2nd April, 1958. (878071.) 10818. Pole changing split pole motor. 3rd April, 1958. (878084.)

11558. Radio &amp; Allied Industries, Ltd.—Television, radio and like apparatus. 13th July, 1959. (878415.)

11820. American Radiator &amp; Standard Sanitary Corporation.—Neutronic reactor. 14th April, 1958. (878097.)

12906. British Insulated Callender's Cables, Ltd.—Electrical insulators. 22nd April, 1959. (878073.)

14452. C. A. Parsons &amp; Co., Ltd.—Dynamo-electric machine stators. 7th April, 1959. (878277.)

16219. Babcock &amp; Wilcox, Ltd.—Nuclear reactors. 20th May, 1959. (878123.)

16316. Taylor Electrical Instruments, Ltd.—Electrical measuring instruments. 21st May, 1959. (878462.)

16374. Pye, Ltd.—Television pick-up tubes. 21st May, 1959. (878282.)

24406. General Electric Co., Ltd.—Apparatus for recording the epoch of the incidence of an electrical disturbance or signal. 29th July, 1959. (878467.)

24738. Siemens-Schuckertwerke A.G.—Semiconductor rectifiers of the p-n junction type. 31st July, 1958. (878100.)

29897. General Motors Corporation.—Transistor electric amplifiers. 18th September, 1958. (878471.)

35898. Compagnie Industrielles des Téléphones.—Electronic switching devices. 7th November, 1958. (878105.)

36526. Okonite Co.—Corona-testing of the insulation of electric wires and cables. 13th November, 1958. (878354.)

36664. United States Atomic Energy Commission.—Nuclear reactor. 14th November, 1958. (878180.)

38408. Bell &amp; Lee, Ltd.—Capacitors. 20th November, 1959. (877940.)

39851. General Electric Co., Ltd.—Electric cartridge fuses. 27th October, 1959. (877941.)

40206. Middlesex Oil &amp; Chemical Works, Ltd.—Electrical insulating compositions. 7th December, 1959. (877895.)

1959

1144. Noma Electric Co., Ltd., and Capel, F. E.—Lampholder and connector device. 12th January, 1959. (877946.)

2263. General Electric Co., Ltd.—Gas-cooled heterogeneous nuclear reactors. 21st January, 1960. (877679.)

2593. Tesla, Narodni Podnik.—Electric analogue for harmonic synthesis. 23rd January, 1959. (877795.)

2641. Siemens &amp; Halske A.G.—Telephone coin box arrangements for use in connection with local dialling and/or trunk dialling. 23rd January, 1959. (877815.)

5353. Associated Electrical Industries, Ltd.—Dynamic braking for induction motors. 29th January, 1960. (878020.)

5591. Brown, Boveri &amp; Co., Ltd.—Electrical distance protective apparatus. 18th February, 1959. (877698.)

7734. Megator Pumps &amp; Compressors, Ltd.—Float controlled electric switch assemblies. 19th February, 1960. (877699.)

8334. Ericsson Telephones, Ltd.—Electrical computing apparatus. 18th May, 1960. (877267.)

8810. Standard Telephones &amp; Cables, Ltd.—Television receiver with interference suppression for picture and sound. 13th March, 1959. (877126.)

9509. Square D Co.—Clips for fuses. March, 1959. (878023.)

10387. Conradty, E. K., Conradty, P., and Conradty, C.—Screwed nipple joints in carbon or graphite electrodes for electric furnaces. 25th March, 1959. (877352.)

10573. Electrolux, Ltd.—Suction cleaners. 26th March, 1959. (877825.)

10592. Standard Telephones &amp; Cables, Ltd.—Arrangement for the capacitive control of the magnitude of a d.c. voltage. 26th March, 1959. (877798.)

10871. Perkin-Elmer Corporation.—Voltage controllers. 31st March, 1959. (878045.)

11258. Radio Heaters, Ltd.—High frequency heating apparatus. 1st April, 1960. (877014.)

11877. Deutsche Gold- und Silberscheidanstalt.—Fuel element for nuclear fission reactors and process for the manufacture thereof. 8th April, 1959. (877065.)

12315. Rivlin, J.—Electric light fittings. 11th July, 1960. (877816.)

## NEXT WEEK'S EVENTS [continued]

## THURSDAY, 12th OCTOBER (continued)

Glasgow.—Scottish Building Centre, 425, Sauchiehall Street, 7.15 p.m. Institution of Plant Engineers, Glasgow Branch. "Accident Prevention from the Plant Engineer's Standpoint."

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilisation Section. Chairman's address, "Research in the Field of Electricity Utilisation" by Dr. H. G. Taylor.

A.S.E.E. South West London Branch. Visit to English Electric House.

Lecture Hall, Royal Society of Arts, John Adam Street, Adelphi, W.1, 7 p.m. Radar and Electronics Association. "Space Communications" Part I: "Systems and Equipment," by L. F. Mathews.

Manchester.—Demonstration Theatre, N.W.E.B., Town Hall Extension, 6 p.m. I.E.S. Manchester Centre. "The New I.E.S. Code," by J. G. Holmes.

Middlesbrough.—Cleveland Scientific and Technical Institution, 7.30 p.m. Society of Instrument Technology, Tees-Side Section. "Automation in the Post Office," by N. Burley.

Nottingham.—People's College of Further Education, Castle Road, 7.30 p.m. A.S.E.E. Nottingham Branch. "Control Centres for Modern Industry," by R. Ritchie.

Electricity Centre, Carrington Street, 6 p.m. I.E.S. Nottingham Centre. Chairman's address.

Scunthorpe.—Blue Bell Hotel, 7.30 p.m. Institution of Plant Engineers, Sheffield and District Branch. "Problems in Rolling Mills," by W. Bailey.

Spalding.—E.M.E.B. Showrooms, 7.30 p.m. I.E.E. East Midland Centre. "The I.E.E. Wiring Regulations," by F. Jackson.

Swansea.—Electricity Board Showrooms, Kingsway, 6 p.m. I.E.E. West Wales Sub-Centre. Chairman's address by W. E. Lewis.

Torquay.—Torre Abbey, The King's Drive, 3 p.m. I.E.E. South Western Sub-Centre. Chairman's address by D. H. Macnee.

## THURSDAY, 12th to SATURDAY, 14th OCTOBER

Southport.—Cambridge Hall, Council for the Preservation of Rural England. National Conference on Preservation of the Countryside.

## FRIDAY, 13th OCTOBER

Aberdeen.—Robert Gordon's Technical College, 6 p.m. I.E.E. North Scotland Sub-Centre. Scottish Centre chairman's address by Professor E. G. Culwick.

Birmingham.—Lecture Theatre, Byng Kendrick Suite, Gosta Green College of Technology, Aston Street, 7 p.m. Society of Instrument Technology, Midland Section. "Differential Producers for Flow Measurement" by H. E. Dall.

Hanley.—Grand Hotel. A.S.E.E. Stoke and Crewe Branch. Annual dinner.

London.—Caxton Hall, S.W.1, 6.30 p.m. Electrical Power Engineers' Association, National Technical Groups. "The Meaning of Engineering," by W. T. O'Dea.

Pepys House, 14, Rochester Row, Westminster, S.W.1, 7 p.m. Junior Institution of Engineers. "The Technician, Education and Industry," by J. Heywood.

Nottingham.—Victoria Station Hotel. Institution of Heating and Ventilating Engineers, East Midlands Branch. Ladies' evening.

Reading.—Calcot Hotel. A.S.E.E. Reading and Districts Branch. Annual dinner and dance.

## SATURDAY, 14th OCTOBER

Liverpool.—Mecca Restaurant, Exchange Street East. A.S.E.E. Liverpool and District Branch. Annual dinner and dance.

12583. Kabushiki Kaisha Hitachi Seisakusha.—Low loss capacitors. 14th April, 1959. (877305.)

13892. Elektro-Bau A.G.—Dynamo-electric machines having permanent magnet pole wheels. 20th April, 1960. (877316.)

14418. Burco, Ltd.—Drying cabinets. 1st February, 1960. (878046.)

14662. Decca Record Co., Ltd.—Electrical analogue computing apparatus. 28th April, 1960. (877774.)

15328. Electric Storage Battery Co.—Electric storage battery vent plugs. 5th May, 1959. (877220.)

17757. Associated Electrical Industries, Ltd.—Shaping slices of semiconductor materials. 3rd May, 1960. (877833.)

18644. Sunbeam Corporation.—Electric mixer. 1st June, 1959. (877068.)

19512. General Electric Co., Ltd.—Electric heating elements. 8th June, 1960. (877776.)

19877. Philips Electrical Industries, Ltd.—Electronic data processing circuit arrangements. 10th June, 1959. (877777.)

20379. Parker-Hannifin Corporation.—Fluid-seal for electrical connection joints. 15th June, 1959. (877861.)

20426. Associated Electrical Industries, Ltd.—Arrangements for dissipating heat generated in semiconductor devices. 2nd June, 1960. (877020.)

21298. Pressac, Ltd.—Holder for electric lamp bulbs. 30th May, 1960. (878050.)

21372. Allis-Chalmers Manufacturing Co.—Electric motor control system. 22nd June, 1959. (877669.)

22648. Cimex, Ltd.—Vacuum floor-cleaning machines. 21st May, 1960. (877778.)

23765. United Kingdom Atomic Energy Authority.—Fuel elements for nuclear reactors. 31st May, 1960. (877703.)

24471. Lion, K. S.—Electric system for converting a charge in a substantially linear impedance to a corresponding voltage. 16th July, 1959. (877572.)

29783. Clevite Corporation.—Semiconductor device. 1st September, 1959. (877071.)

30074. Durowe A.G.—Electric device for driving a member performing mechanical oscillations. 3rd September, 1959. (879061.)

30417. Westinghouse Electric Corporation.—Thermopiles. 7th September, 1959. (877544.)

30613. General Electric Co.—Semiconductor device. 8th September, 1959. (877285.)

31304. Siemens-Schuckertwerke A.G.—Processes for the production of electrical contacts and contacts produced thereby. 14th September, 1959. (877286.)

32048. Muller, G.—Co-operating electrical contacts engageable by relative sliding displacement. 21st September, 1959. (877674.)

33082. Ojima, Y.—Coil winding machines. 29th September, 1959. (877388.)

33522. Tudor AB.—Electric cells. 2nd October, 1959. (877896.)

33777. Standard Telephones & Cables, Ltd. (Nippon Electric Co., Ltd.)—Capacitor. 6th October, 1959. (877594.)

34095. Standard Telephones & Cables, Ltd.—Manufacture of electric cable. 8th October, 1959. (877200.)

36146. Midgley, A. H.—A.c. synchronous electric motors. 18th March, 1960. (877478.)

36625. United-Carr Fastener Corporation.—Electrical switches. 28th October, 1959. (877562.)

37250. Brookhirst Igranic, Ltd.—Electrical rectifier systems. 3rd November, 1959. (877041.)

37256. Marconi Instruments, Ltd.—Electrical warning systems for nuclear reactors. 23rd May, 1960. (877839.)

38775. Corning Glass Works.—Television picture reproducing tubes, method of their manufacture. 16th November, 1959. (877363.)

40380. Elektrowärme Altenburg Veb.—Vacuum cleaners. 27th November, 1959. (877883.)

42246. Wurlitzer Co.—Resonant reed electromagnetic relay. 11th December, 1959. (877755.)

42837. Bendix Corporation.—Sealed pressure operated electric switches. 16th December, 1959. (877367.)

## 1960

397. Microwave Associates, Inc.—Reactance amplifiers. 5th January, 1960. (877757.)

450. London Electrical Manufacturing Co., Ltd.—Electrical capacitors. 27th January, 1960. (877205.)

961. Sangamo Weston, Ltd.—Fastening arrangements for use in electrical instruments. 11th January, 1960. (877980.)

1247. Brookhirst Igranic, Ltd.—Apparatus for counting articles being conveyed. 13th January, 1960. (878452.)

1976. Bofors A.B.—Control rod for nuclear reactors. 19th January, 1960. (877844.)

2519. Don-Lan Electronics, Inc.—Electrical switch. 22nd January, 1960. (878433.)

3609. Westinghouse Electric Corporation.—Semiconductor rectifier structures. 2nd February, 1960. (878235.)

5099. General Electric Co.—Fluid-cooled dynamo-electric machines. 12th February, 1960. (877743.)

6685. Sulzer Freres S.A.—Control of nuclear power plants. 25th February, 1960. (878436.)

6842. Philips Electrical Industries, Ltd.—Methods of manufacturing anode discs for use in rotary-anode X-ray-tubes. 26th February, 1960. (877847.)

8994. Sylvania Electric Products, Inc.—Method for use in making grid electrodes for

electron discharge devices. 14th March, 1960. (878181.) 8995. Method and apparatus for the manufacture of frame grids. 14th March, 1960. (878352.)

12380. Brown, Boveri & Co., Ltd.—Method of treating the surface of semiconductor elements. 7th April, 1960. (878441.)

12921. Microwave Associates, Inc.—Mixer crystal rectifier tubes. 11th April, 1960. (878209.)

13045. Institut Za Ratsionalisatsia.—Coin-box telephone instrument for telephone systems. 12th April, 1960. (878210.)

13215. Landis & Gyr A.G.—Electric pulse counting apparatus. 13th April, 1960. (877986.)

16156. Standard Telephones & Cables, Ltd.—Method of manufacturing cooling bodies for cooling electrical components. 6th May, 1960. (877644.)

17284. Siemens-Schuckertwerke A.G.—Method of, and an apparatus for, producing stranded elements consisting of individual cores for telecommunications cables. 16th May, 1960. (Addition to 850743.) (878005.)

20688. Philips Electrical Industries, Ltd.—Grids for electron tubes. 13th June, 1960. (878238.)

22026. Behr, M. (trading as Süddeutsche Kühlerfabrik, J. F. Behr).—Diesel electric locomotives. 23rd June, 1960. (877663.)

24575. Philips Electrical Industries, Ltd.—Lighting fittings. 14th July, 1960. (878211.)

24682. Standard Telephones & Cables, Ltd.—Direct-coupled transistor amplifiers. 15th July, 1960. (878289.)

24696. Electrolux Corporation.—Vacuum cleaners. 15th July, 1960. (878360.)

## TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 27th October.

**Courier.** No. 822,326. Class 8. Electric shavers.—Kent Kordless, Ltd., 106, Edmund Street, Birmingham, 3.

**Summit.** No. 793,615. Class 9. Connectors for clocks, rubber connections and rubber sockets, soldering irons, saucepans, kettles and coffee percolators, all being electric.—Edmundsons Electrical Wholesalers, Ltd., 240/250, Ferndale Road, London, S.W.9.

**Traniac.** No. 806,770. Electrical apparatus and instruments included in Class 9.—Aktiebolaget Hagglund & Soner, Sweden. Address for service: Eric Potter & Clarkson, 14, Oxford Street, Nottingham.

**Granadafon.** No. 812,858. Class 9. Electrical induction communication apparatus and sound recording and sound reproducing apparatus.—Granada Group, Ltd., 36, Golden Square, London, W.1.

**Silafon.** No. 815,787. Class 9. Scientific and electrical apparatus and instruments; radio apparatus; talking machines and calculating machines.—Siemens & Halske Akt.-Ges., Germany. Address for service: Haselton, Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

**Radarat.** No. 821,667. Class 9. Electrical and electronic apparatus for the handling and processing of radiolocation and speed signal information.—Marconi's Wireless Telegraph Co., Ltd., English Electric House, Strand, London, W.C.2.

**Aerotan.** No. 821,859. Class 9. Electrolytic capacitors.—Aerovox Corporation, U.S.A. Address for service: F. J. Cleveland & Co., 29, Southampton Buildings, Chancery Lane, London, W.C.2.

**Icarus.** No. 823,746. Class 9. Radar reflectors.—A. C. Cossor, Ltd., Cossor House, Highbury Grove, London, N.5.

**Triplanta Thermopad.** No. 813,357. Class 11. Electrically heated wall, floor and ceiling panels and mats, all in the form of pads or including padding.—Triplana Thermal Acoustics, Ltd., Cromford House, Cromford Court, Manchester, 4.

**Nimbus.** No. 817,261. Class 11. Electric light fittings and parts.—Falcon. No. B818,463. Class 11. Electric fans and parts.—General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

### BOOKS RECOMMENDED BY ELECTRICAL REVIEW

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**PRINCIPLES OF TRANSISTOR CIRCUITS**, 2nd Edition 21s (by post 22s)

**DOMESTIC WATER HEATING** 25s (by post 26s)

**MODERN ELECTRICAL CONTRACTING** 10s 6d (by post 11s 4d)

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# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

### CONTRACTS OPEN

**Argentina.**—Water and Power Board. 28th March, 1962. Extension of Sorrento power station and construction of transformer substation. (E.S.B. 30714/61.)\*

**Direccion de la Energia, Buenos Aires.** 20th October. Transformer substation. (E.S.B. 29988/61.)\* 31st October. Electrification network. (E.S.B. 29987/61.)\*

**Australia.**—State Electricity Commission of Victoria. 23rd October. Eighteen outdoor transformers. (E.S.B. 30470/61.)\*

**Burma.**—Purchase Board. 18th October. Cable. (E.S.B. 30728/61.)\* Electric lamps and fittings. (E.S.B. 30727/61.)\*

**Canada.**—Toronto Transit Commission. 6th November. Bloor-Danforth-University subway. (E.S.B. 30006/61.)\*

**Egypt.**—Ministry of Public Works. 31st October. Switchgear and controls. (E.S.B. 29994/61.)\*

**Frimley and Camberley.**—U.D.C. 16th October. Installation of refrigerators in Council houses. (See Classified Advertisement Section.)

**Germany.**—N.A.T.O. Infrastructure Contract. Electronic air traffic control equipment and runway control vans. Application to tender by 17th October. (G.D. 2777/61 (161).†

**India.**—U.P. State Electricity Board. 1st December. Transformers, switchgear and protective equipment. (E.S.B. 30324/61.)\* Heavy Electricals (India), Ltd. 7th December. Coil winding and wire buffing machinery. (E.S.B. 29958/61.)\*

**Gujarat Electricity Board.** 20th October. Switchgear. (E.S.B. 30385/61.)\*

**Punjab State Electricity Board.** 31st October. Transformers. (E.S.B. 30443/61.)\* 20th November. Fuses. (E.S.B. 30385/61.)\*

**Iraq.**—Ministry of Defence. 1st November. Electrical installation in Al-Mansour camp cinema. (E.S.B. 30460/61.)\*

**Italy.**—N.A.T.O. Infrastructure Contract. Radio telegraphic transmitting and receiving station. Notification of wish to tender by 11th October. (G.D. 303/61(140).†

**New Zealand.**—State Electricity Department. 23rd January, 1962. Four 65 MVA synchronous condensers. (E.S.B. 30471/61.)\* Tender Board, Ministry of Works. 27th October. Cable. (E.S.B. 29983/61.)\* 28th November. Lighting system for road tunnel. (E.S.B. 30316/61.)\*

**Pakistan.**—Electricity, Water and Power Development Authority, Lahore. 19th October. Distribution transformers. (E.S.B. 30310/61.)\* 21st October. Switchfuses. (E.S.B. 30482/61.)\* 28th October. Circuit-breakers. (E.S.B. 30483/61.)\* 30th October. Switchboards. (E.S.B. 30484/61.)\*

Director of Supply, Motijheel, Dacca. 16th October. Cables and ohmmeters. (E.S.B. 29978/61.)\* 23rd October. Electrical equipment etc. (E.S.B. 29974/61.)\* 24th October. Electrical appliances. (E.S.B. 29973/61.)\* 25th October. Transformers, pumps and hospital equipment. (E.S.B. 30000/61.)\* 31st October. Refrigeration equipment. (E.S.B. 30307/61.)\*

**Panama.**—Canal Company. Two gas turbo-generators. (E.S.B. 30369/61.)\*

**Portuguese East Africa.**—Ports, Railways and Transport Department. 28th November. Substation equipment. (E.S.B. 30718/61.)\*

**Uruguay.**—State Electricity Board. 21st November. 150 kV overhead line and equipment. (E.S.B. 30330/61.)\*

**Windsor.**—Borough Council. 4th November. Electric lamps (Schedule 15) and electric fittings and cable (Schedule 21) for the year ending 31st December, 1962. Borough engineer, Kipling Building, Alma Road, Windsor.

### ORDERS PLACED

**Glasgow.**—Police, etc., Committee. Electrical installation work at fire station, Easterhouse (£4,762).—W. C. Martin & Co.

Housing Committee. Electrical work in 104 houses, one shop and 10 lock-up garages, Ladywell housing scheme (£24,770).—James Kilpatrick & Son.

**Great Yarmouth.**—East Anglian Regional Hospital Board. Recommended. Electrical services in medical unit at Northgate Hospital (£9,210).—Eastern Electricity Board. Lift (£3,165).—Evans Lifts.

**Lancashire.**—County Education Committee. Renewal of electrical installations in schools:—Whitefield Boys' Grammar School (£7,281).—Wainwrights (Electrical). Ramsbottom County and County Secondary Schools (£4,851).—C. Richardson & Sons. Barrowford County and County Secondary Schools (£4,761).—E. Dewhurst, Eccles Grammar School (£5,296) and laboratories (£1,165).—E. M. Evans & Son, Urmston Grammar School (£7,343).—J. Scott & Co.

### WORK IN PROSPECT

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors*

**Bedwas.**—Factory extension; Megapias, Ltd., Newport Road.

**Birchington (Kent).**—Supermarket and shops, 54-58, Station Road; Elliott, Son & Boynton, surveyors, 86, Wimpole Street, London, W.1.

**Boldon (Co. Durham).**—Bungalows (65) north of Charles Street, Boldon Colliery; U.D.C. surveyor.

**Brentford.**—Rebuilding scheme; Trico-Folberth, Ltd., Great West Road.

**Canterbury.**—Teachers' training college; Robert Mathew & Johnson-Marshall, architects, 24, Park Square East, London, N.W.1.

**Cheadle (Staffs.).**—Health clinic in Ashbourne Road; county architect, County Buildings, Stafford.

**Clackmannanshire.**—Houses (38), South Pilmuir Road development, Clackmannan; county architect, County Offices, Alloa.

**Eastbourne.**—Houses (136), Port Road estate (1962 programme); borough engineer, 2/4, Saffrons Road.

**Edinburgh.**—Erection of Napier Technical College; Dey & Leckie, electrical consultants, 34, Castle Street.

**Epping.**—Motel for Watney-Lyon Motels, Ltd.; Erdi & Rabson, architects, 27, Knightbridge Street, E.C.4.

**Gillingham (Kent).**—Maisonnnettes and flats (20) and clinic, Goudhurst Road; borough engineer, Municipal Buildings.

**Gloucestershire.**—Primary school at Shurdington; county architect, Shire Hall, Gloucester.

**Golborne.**—Houses (30), Oaklands Road, Lowton; J. B. Hoyle, surveyor, Council Offices, Lowton, near Warrington.

**Great Yarmouth.**—Flats and maisonnettes (94), Bull's Lane/Priory Street site, Gorleston; borough engineer, Town Hall.

**Hartlepool.**—Factory for Shardlaw & Co.; Matkin & Hawkins, architects, Barclays Bank Chambers, Fawcett Street, Sunderland.

**Hove.**—Flats (48), Chichester Close; borough engineer.

**Huyton-with-Roby.**—Two-storey Council offices at The Paddock (£60,000); U.D.C. surveyor, U.D.C. Offices, Huyton, Lancs.

**Leeds.**—Works and offices, Sweet Street; Moore & Co. (Leeds), Ltd., 51, St.-Paul's Street.

**Leicestershire.**—Major additions and alterations to Ibstock Secondary Modern School; county architect, 123, London Road, Leicester.

**Letchworth.**—Works extensions; Camco (Machinery), Ltd., Icknield Way.

**Leyburn (Yorks.).**—Houses (22); R.D.C. surveyor.

**Liverpool.**—Eleven-storey block of 64 flats and 18 flats in two-storey blocks, Woolton; city engineer, Municipal Buildings, Dale Street.

**Luton.**—Factory and offices, 7-11, Taylor Street; A. P. Smith, 55, Crowland Road, Luton.

**Newbiggin (Northumberland).**—Secondary school near Welfare Crescent; county architect, 30, Great North Road, Newcastle-on-Tyne.

**Newcastle-on-Tyne.**—School for the Convent of the Sacred Heart; L. J. Couves & Partners, architects, Grainger Chambers, Hood Street.

**Northampton.**—Secondary modern school for boys, Cliftonville Road; H. A. Skerrett, chief education officer, Springfield, Cliftonville, Northampton.

**North Riding.**—Primary school at Guisborough; T. Mellor, architect, Church Road, Lytham St. Anne's.

Proposed primary school at Grangetown; Gelder & Kitchen, architects, 120, Alfred Gelder Street, Hull.

**Oswaldtwistle.**—Junior training centre and hostel, Stanhill Lane/Thwaites Road site; county architect, County Offices, Preston.

**Portsmouth.**—Nurses' training school, St. James Hospital; Leslie Chandler, architect, The Shrubbery, Grove Road, Southsea.

**Southampton.**—Hightown Primary and Bellemoor Secondary Schools; borough architect, Civic Centre.

Extensions and additions to factory; Hobbs The Printers, Millbrook Trading Estate, Southampton.

**Stockton-on-Tees.**—Extensions to engineering works; Harker & Son, Ltd., Church Road, Showroom, etc., Portrack Street, for W. & T. Avery, Ltd.; Marshall & Tweedy, architects, 36, Blackett Street, Newcastle-on-Tyne.

**Sunderland.**—Flats and maisonnettes (160 dwellings), Parade area; borough architect, Grange House, Stockton Road.

**Tottenham.**—Nurses' home for Jewish Hospital; Julian Keyes, architect, 13, Wimpole Street, W.1.

**Weston-super-Mare.**—Boys' secondary modern school, Sandringham Road (£188,000); borough engineer, Town Hall.

**Weybridge.**—Houses and flats (99), Oatlands Drive; Span Developments, Ltd., 5, Foxes Dale, London, S.E.3.

**Widnes.**—Maisonnnettes (140), Ditton neighbourhood unit; borough architect, Brendan House.

\* This information is extracted from the Board of Trade *Export Service Bulletin*. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given. †Telephone: Trafalgar 8855, Ext. 2010.

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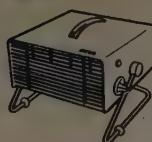
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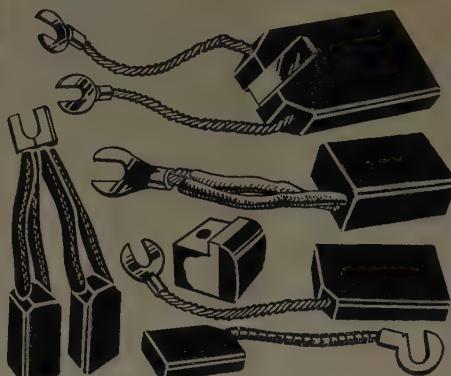
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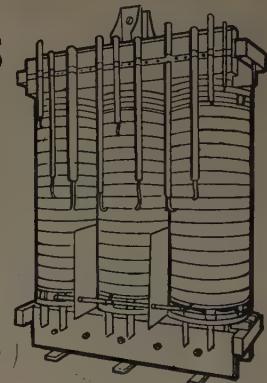
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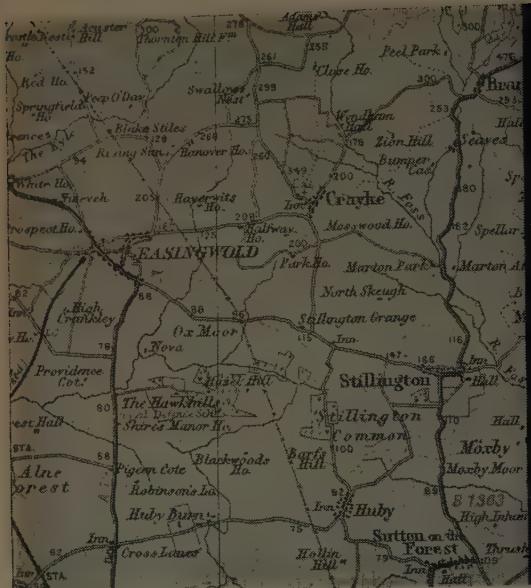
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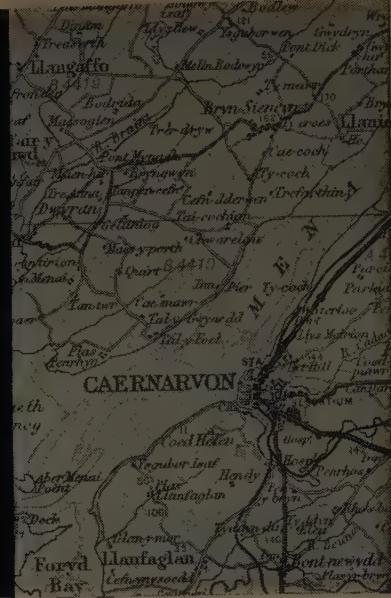
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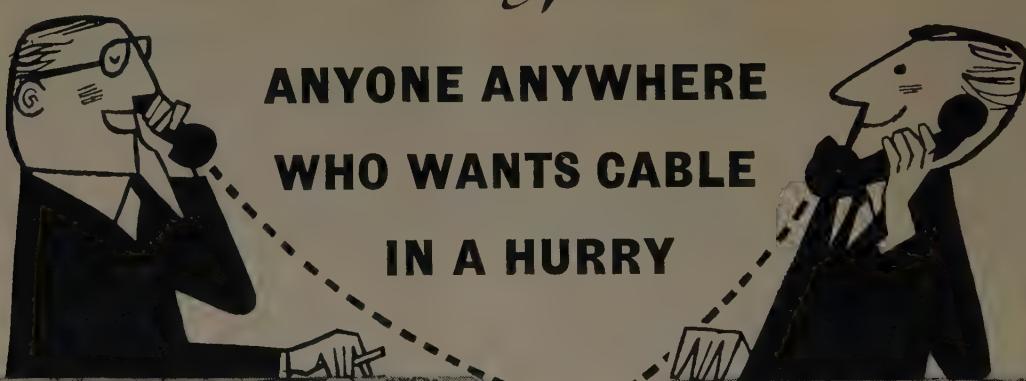
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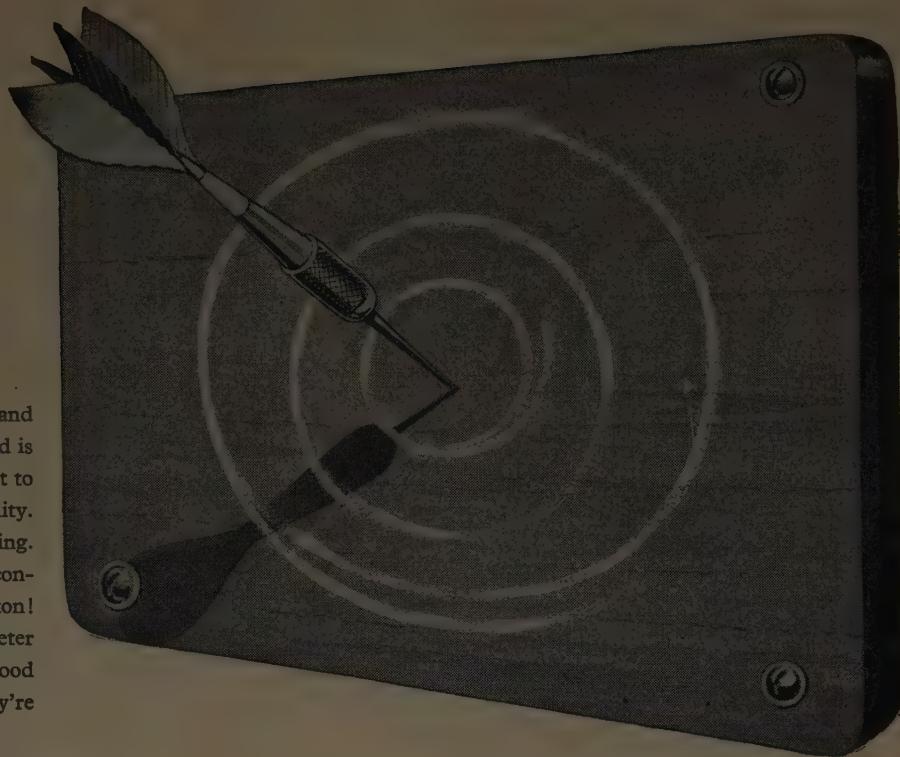
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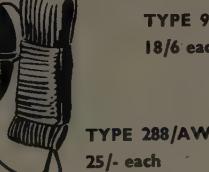
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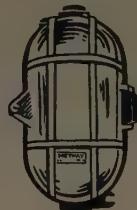
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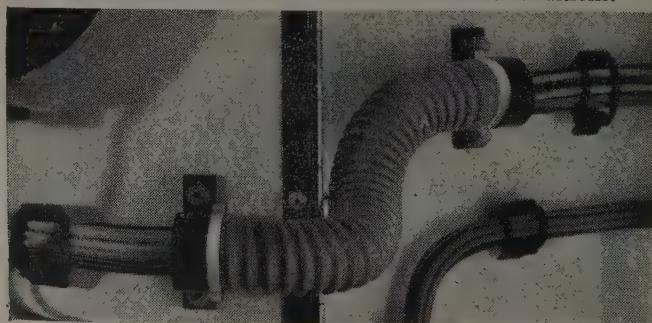
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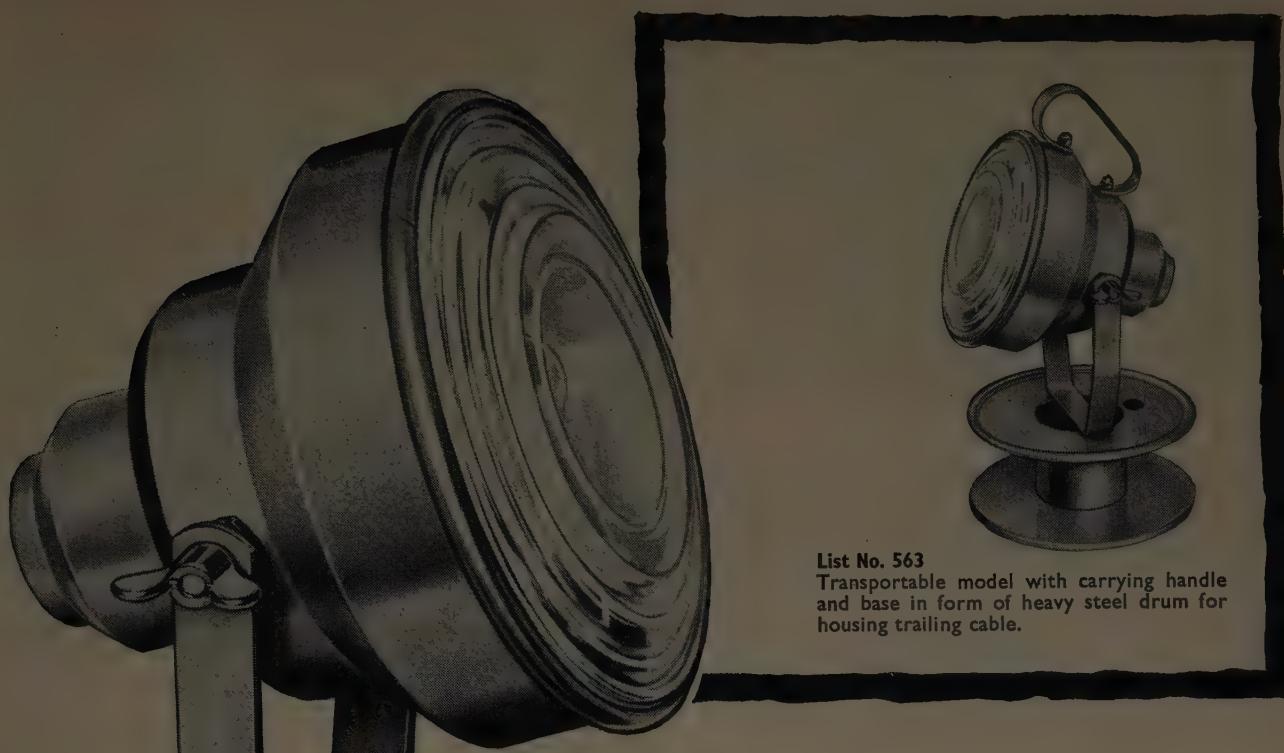


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# ELECTRICITY

## Another successful year and a tremendous growth in demand

### Sales of Electricity and the Financial Surplus

The actual figure of surplus was £16.3 million, some £10 million less than the year before, due mainly to higher costs. Another reason was a fall of about 2 per cent in the average price per unit; this was because, through the operation of two-part or block tariffs, the average price to most consumers falls as their consumption rises.

Sales of electricity were more than 12 per cent up on the previous year—greater than had been foreseen—but all demands had been met in full. However, this unexpectedly large growth in demand needed to be given special consideration when the industry was making its annual review of new construction programmes.

The Chairman went on to say that the trend in sales promised well for the nation. The use of more electricity meant greater productivity in industry, agriculture and commerce, and a higher standard of living generally. But the country should understand that a very heavy programme of capital expansion would be needed to keep up with the demand. This called for investment on an increasing scale.

### How Much Capital?

Sir Robertson referred to the long-term capital development plans drawn up by the industry each year and kept under constant review. In 1958 it had become necessary to obtain increased borrowing powers. The plans at that time showed that £2,130 million of capital expenditure would be needed (at 1958 price levels) over the seven years

to March, 1965. With regard to borrowings up to the end of that period, Parliament raised the ceiling of the industry's borrowing powers from £1,400 million to £1,800 million or whatever higher figure, up to a limit of £2,300 million, might be allowed by the Minister of Power with the approval of the House of Commons. At the end of March, 1961 the total borrowed stood at £1,624 million. The Electricity Council would soon be seeking permission therefore to proceed to the next stage of borrowing.

### Self-Financing

So much for borrowing. The next question was; how much should the consumer contribute? When the seven-year programme was prepared in 1958 it was envisaged that depreciation provisions, surpluses and other internal resources would provide about 48 per cent of the total capital required. This proportion seemed to strike a reasonable balance between the consumers' interests and the need to limit borrowing.

Sir Robertson drew attention to the following table showing how closely actual results had compared with estimates over the first three years of the seven-year programme.

Capital Requirements	1958-59 to 1960-61	
	Estimated in 1958	Actual
Generating Board	584	594
Twelve Area Boards	263	279
Working capital variation	3	(—) 29
	<u>850</u>	<u>844</u>

Financed from  
Depreciation provi-  
sions, surpluses and  
other internal  
resources

380 (44.8%) 385 (45.6%)

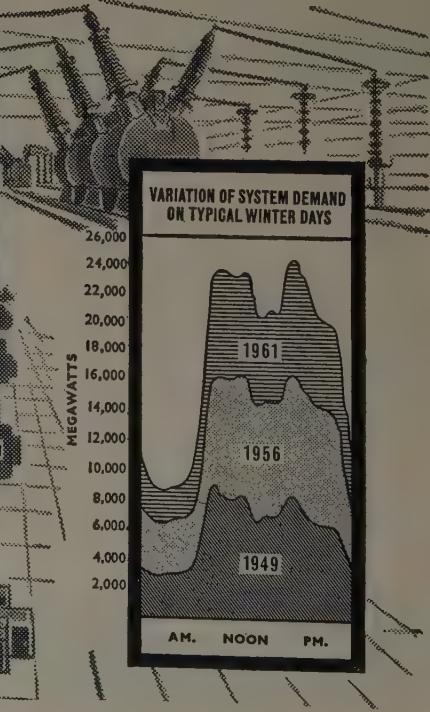
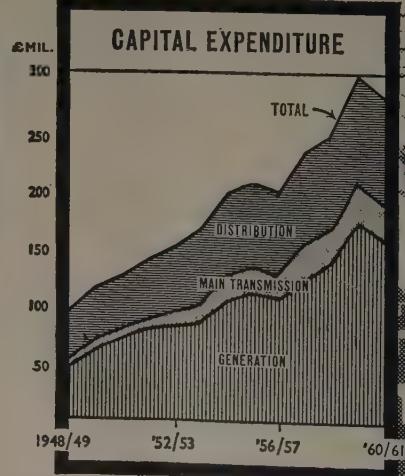
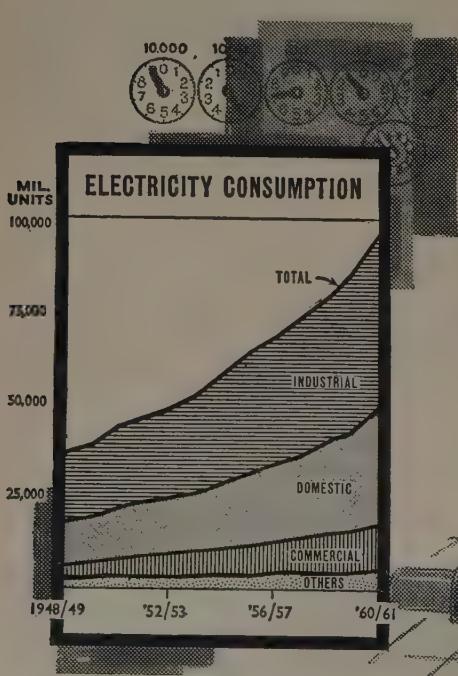
Net borrowing £470 m. £459 m.

### More Power—More Plant

However, it was now very clear that the rise in electricity consumption could not be satisfied without acceleration of plant construction programmes. It was expected that the industry would have to face a maximum demand of over 33,000 MW in the winter of 1964-65—more than 12 per cent above the forecast made in 1958—and the most recent estimates suggested that subsequently, in the two years to 1966-67, it would rise by a further 5,000 MW.

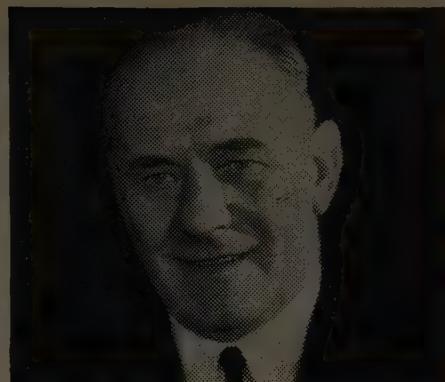
In order to meet the necessary programme of power stations (conventional and nuclear), transmission lines and distribution systems, the estimates made in 1958 would have to be increased by some £200 million to cover the period to the end of 1964-65, and the continued rise in maximum demand would call for an outlay in excess of £400 million a year on fixed assets in the succeeding two years.

Sir Robertson pointed out that to reach the degree of self-financing involved, increasing surpluses were needed year by year, these surpluses, together with provisions for depreciation, being



The Annual Report of the Electricity Council was presented in London on Sept. 26th by the Chairman, Sir Robertson King, K.B.E.

Sir Robertson said that the financial year ended 31st March, 1961, had at least two features of some significance. The electricity supply industry had as usual shown a surplus after payment of all interest charges; and the increase in sales of electricity was the highest for ten years.



SIR ROBERTSON KING, K.B.E.

the main source of finance from internal resources. For this reason, and to cover increased costs of over £20 million per annum from wage and salary increases and a rise in coal prices, the Boards had been obliged to announce increases in most of their tariffs. Even so, these new tariffs had not taken into account cost increases of approximately £10 million per annum, arising from changes in the tax on fuel oil in the Finance Act, 1961.

#### Planned Surpluses

If cost increases, as they occurred, were not balanced by new revenues or even greater economies, more money had to be borrowed. The self-financing programme depended on achieving planned surpluses.

The term "surplus" did not imply something over and above the needs of the industry. It was a contribution from revenue to capital development.

The additional capital requirement of £200 million above the forecasts to 1964-65 and the heavy programme foreseen for subsequent years called for a full financial review, which was taking place in the setting of the Government's White Paper on the Financial and Economic Obligations of the Nationalised Industries. As a result financial objectives for the Boards would be determined for a period of five years, subject to review annually, within a framework settled with the Minister of Power. For the industry as a whole this would call for increased annual surpluses during the period. These higher surpluses would be essential if the industry were to achieve a financial performance in accordance with the requirements of the Government's White Paper and if it were to find the capital resources it needed, while keeping its borrowings within manageable limits.

#### Increased Prices not Automatic

The Chairman explained that the electricity supply industry did not think in terms of automatic increases in prices to cover increases in costs. There was ample evidence of this. Over the last ten years or so, power station fuels had risen 60 per cent in price; the cost of mechanical and electrical engineering materials had risen by 60 per cent and 40 per cent respectively; building and civil engineering costs had increased by more than 35 per cent and the interest rate on borrowed capital had nearly doubled. Against these increases, the industry had brought to bear considerable advances in technology, in the use of manpower and management techniques. As a result, the average price per unit of electricity sold to consumers as a whole in 1960-61 was

kept down to 1.480d. as against 1.188d. ten years ago, an increase of no more than 25 per cent. It could be demonstrated that in relation to the overall level of retail prices electricity was actually 16 per cent cheaper. The Council considered it part of their duty to make known at every level in the industry how large a proportion of the nation's capital was going into electricity supply and the importance of ensuring that the most economic ways of deploying it were found.

#### Most Effective Use of Capital

The capacity of the supply industry was more fully used than most capital assets in British industry. Power station plant installed during the last ten years or so had worked on a year-round average of 100 hours per week. In addition there were special projects designed to ease the problem of meeting the daily peak loads. For example, the 300 MW pumped storage scheme at Blaenau Ffestiniog would enable electricity to be generated at peak hours by means of water previously pumped up to a high level reservoir by the most economical stations in off-peak hours. And again, the cross-Channel link with Electricité de France would be coming into commission soon. Because of the differences in the incidence of peak demand in the two countries, 160 MW of load could be transferred in either direction, with savings to both parties.

These were on the production side. So far as the customer was concerned the Area Boards were active in promoting those uses of electricity, such as refrigeration and water heating, which

helped to create a balanced load. Even more important, they encouraged the wider use of storage heating and new industrial techniques with loads occurring in off-peak periods, or which permitted load reduction at peak times. Following the introduction of special terms for supplies made available during specified off-peak periods there had been a spectacular increase in the number of off-peak units sold.

#### Constant Search for Consumer Benefits

Sir Robertson King, who retires from the chairmanship of the Electricity Council on 31st December next, said that he could talk at length about other major achievements of the industry. Such features as: the completion of a rural electrification programme by which supply had been brought to 85 per cent of all farms in England and Wales; the continuing improvement in the thermal efficiency of power stations; and the increasing output of the industry as related to the number of employees. He could also refer to some of the major problems facing the industry. In particular, the difficulty of achieving a reasonable balance between the development of an economical supply system and the effect such development has on the beauty of the countryside and other amenities. The industry was facing up to these and other problems and the striking growth of the research programmes, now running at over £2½ million a year on revenue account, testified to the constant search for new, improved and cheaper ways to serve the electricity consumer.

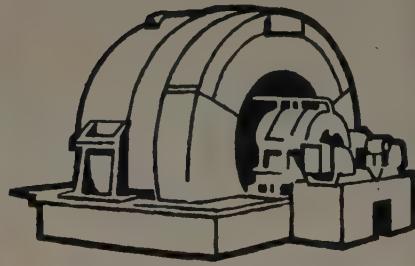
TRADING RESULTS		FINANCIAL POSITION AT YEAR END				
	£ million	1960-61	1959-60	£ million	1960-61	1959-60
Gross income from all trading activities	665	615		Fixed assets at cost	3,209	2,929
Operating and other costs (excluding depreciation)	465	425		less depreciation and other capital provisions	1,104	1,004
	200	190			2,105	1,925
Depreciation	104	93	—	Current assets less current liabilities	14	22
Interest and financial charges, etc.	80	184	70	Net assets	2,119	1,947
Net surplus—used to finance capital requirements	16	27		Financed as follows:		
				External borrowings	1,949	1,793
				Reserves (other than depreciation)	170	154
					2,119	1,947

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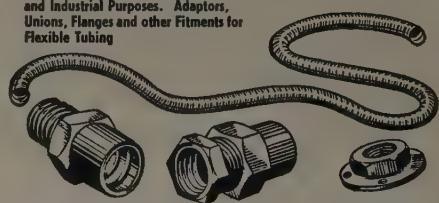


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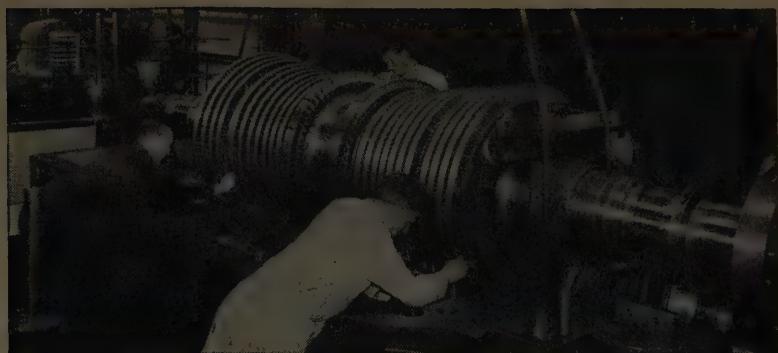
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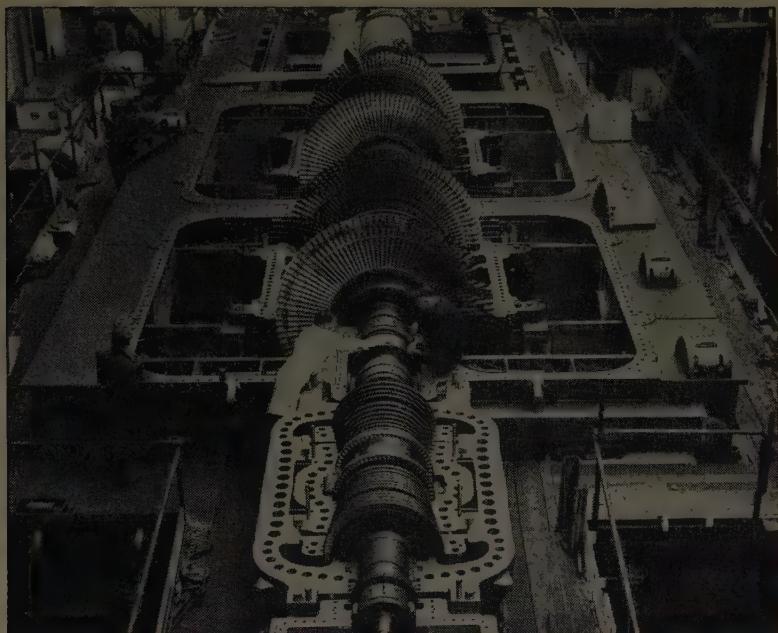
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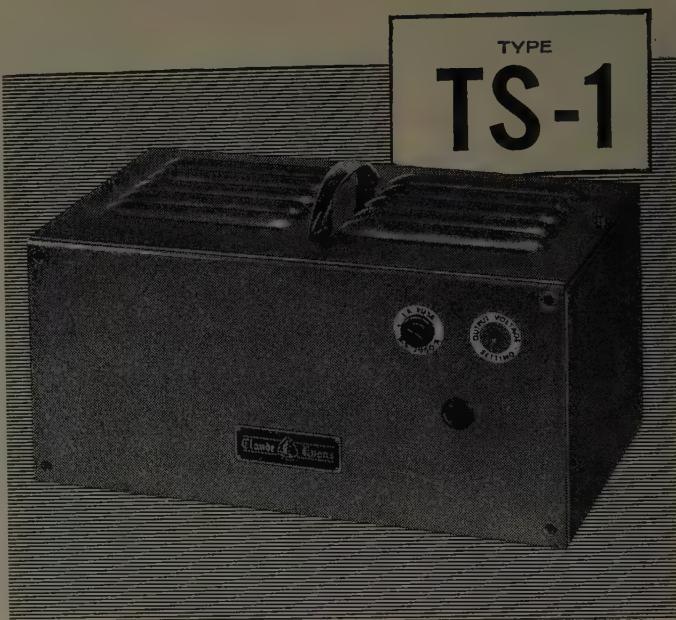
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**FAST** 40 volts/sec correction speed

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**RELIABLE** Transistorised control unit—no valves or relays

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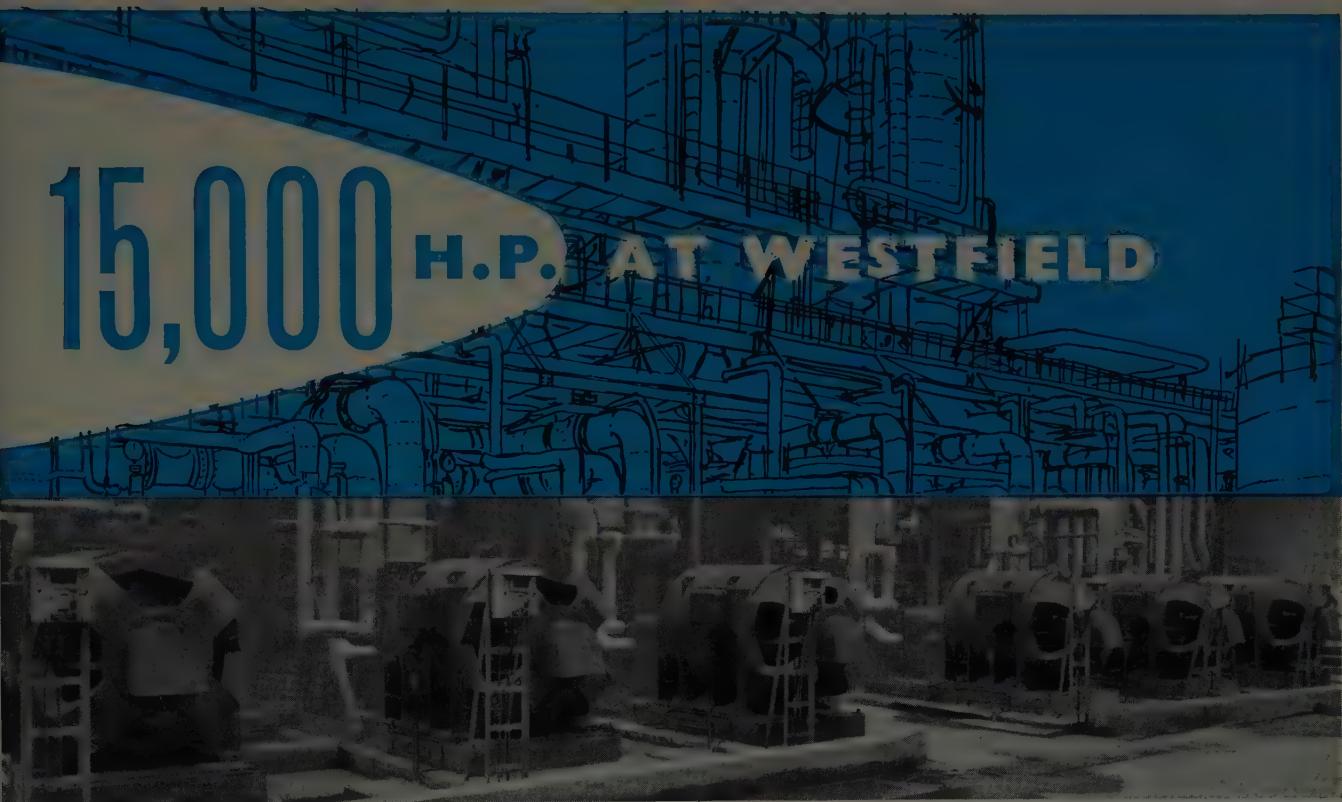
**PRICE—ONLY £69.10s. NET. Rack model £72. 5s. net**

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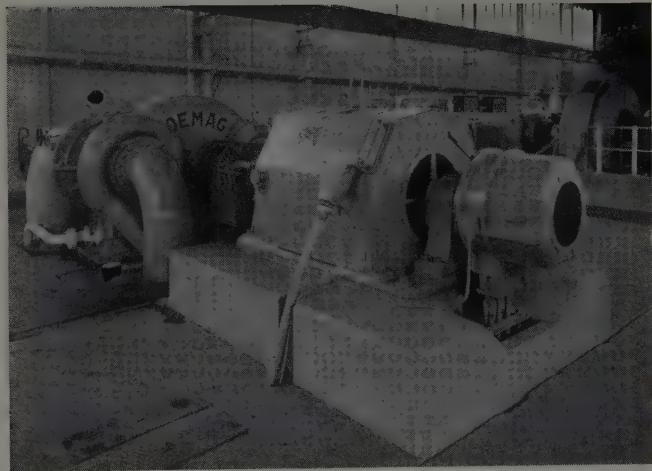


A group of closed-air-circuit weatherproof squirrel-cage induction motors driving carbonate pumps. Of 225 and 350 h.p. at 2950 r.p.m. these machines are direct-on-line started and operate at 3.3 kV.

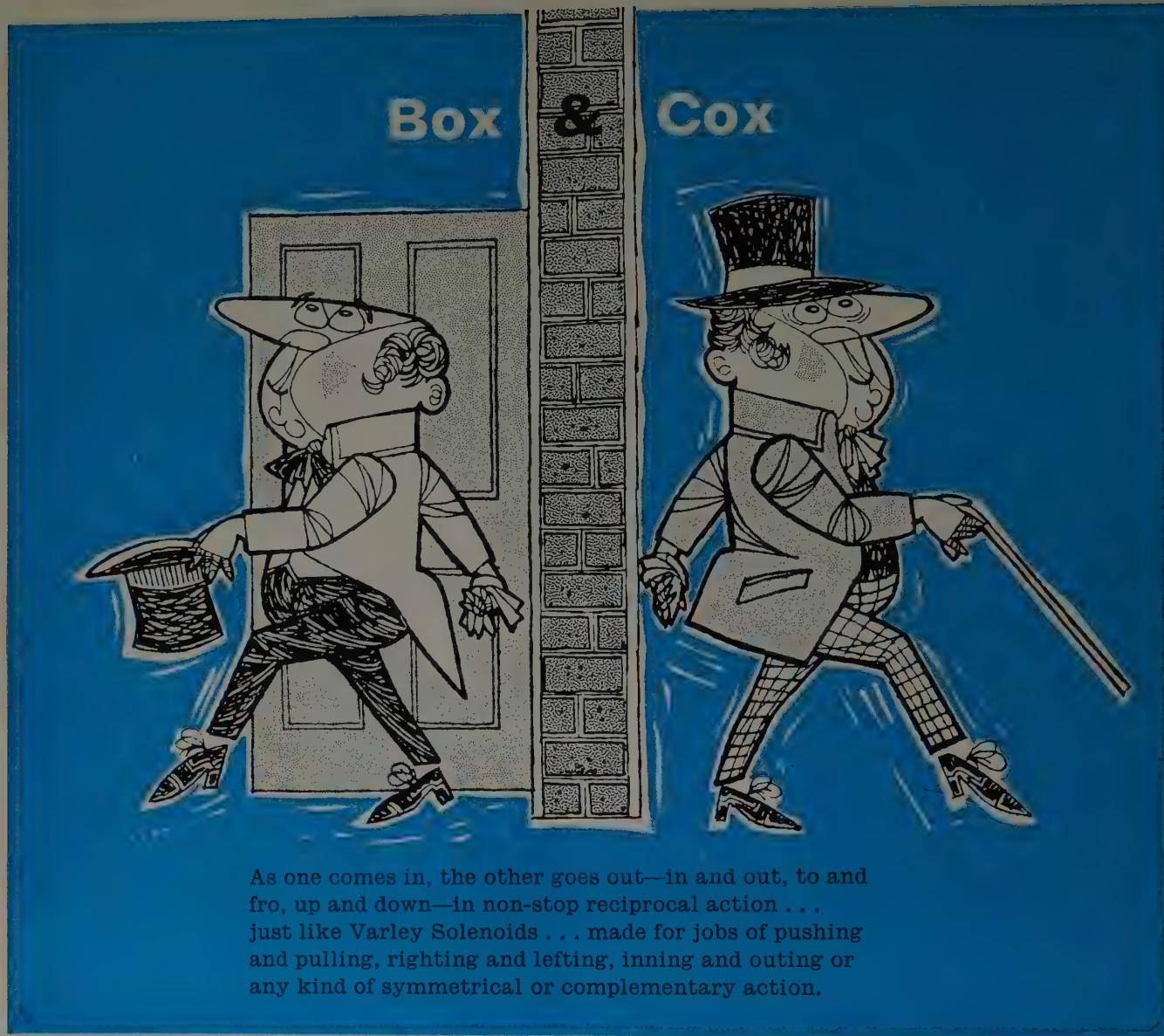
Bruce Peebles manufactured the majority of the motors for the Scottish Gas Board's "Lurgi-type" high-pressure gasification plant at Westfield, Fife. Some 220 motors totalling over 15000 h.p. and of almost every type and enclosure were supplied, and amongst the unusually wide variety of motor applications are reciprocating compressors, various types of pumps, fans and boosters, and conveyors. Also supplied were induction generators for process energy recovery, and the control panels for the larger slippings and synchronous induction motors.



One of two 1450 h.p. 375 r.p.m. 3.3 kV screen-protected salient-pole synchronous induction motors driving reciprocating compressors.



One of two 1800 h.p. 1480 r.p.m. 3.3 kV screen-protected slippings induction motors driving turbo-type compressors.



As one comes in, the other goes out—in and out, to and fro, up and down—in non-stop reciprocal action . . . just like Varley Solenoids . . . made for jobs of pushing and pulling, righting and lefting, inning and outing or any kind of symmetrical or complementary action.

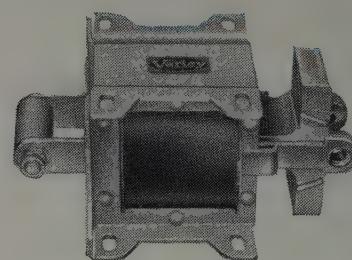
# Varley

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## solenoids

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D2

Laminated construction. All round fixing arrangements. Thrust types fitted with straight through guide bars to which can be fitted either rollers or thrust blocks. Performance: 4 to 7 lbs. through  $\frac{1}{4}$ " stroke (depending on rating).



For full details of Varley Solenoids, write for Illustrated Catalogue L.2.

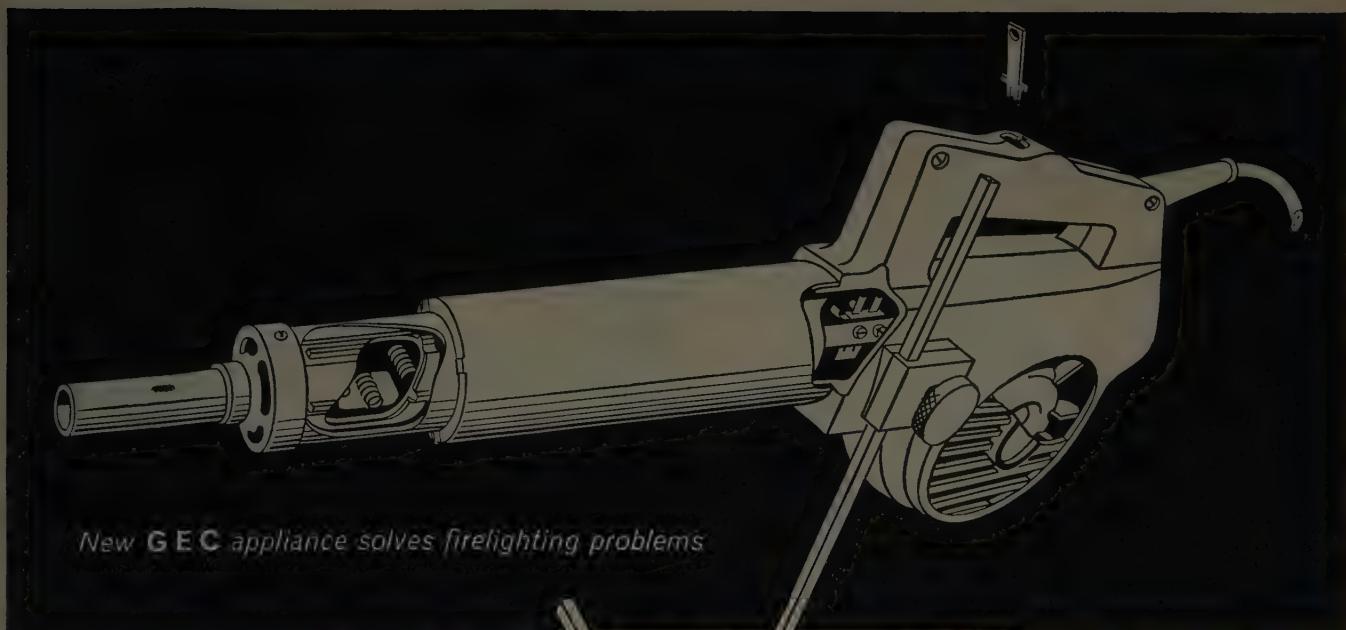
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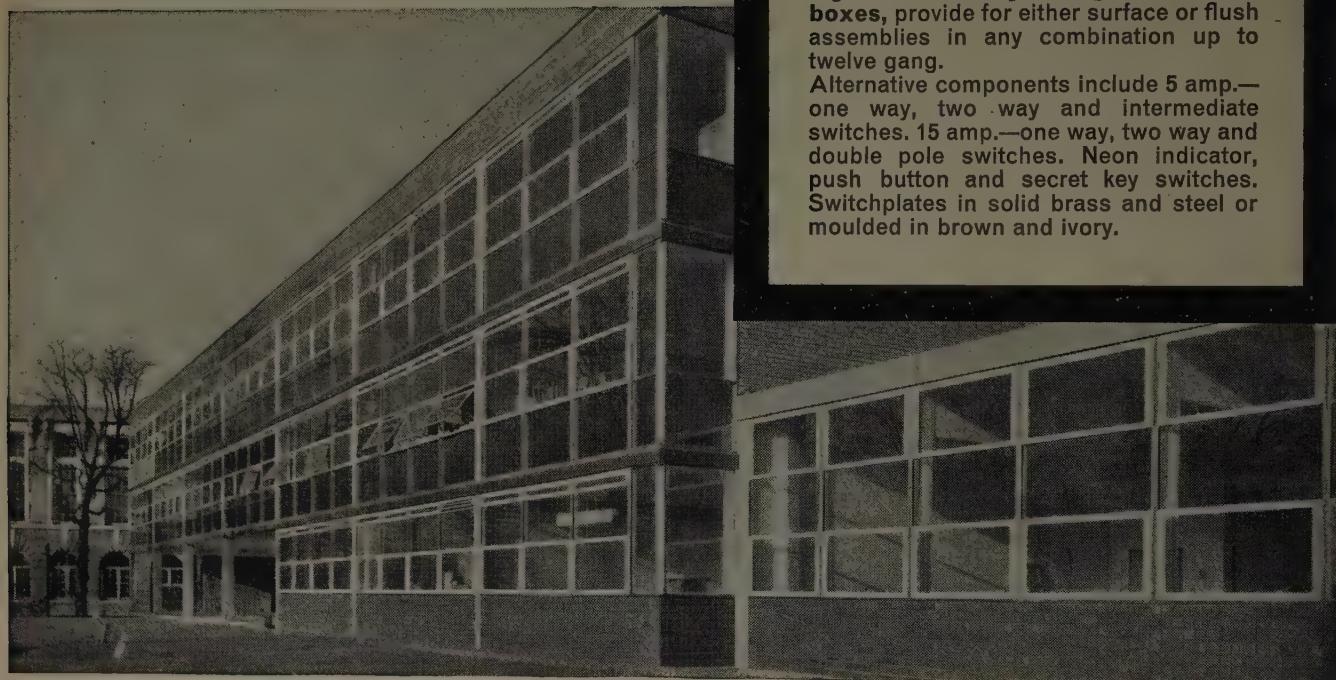


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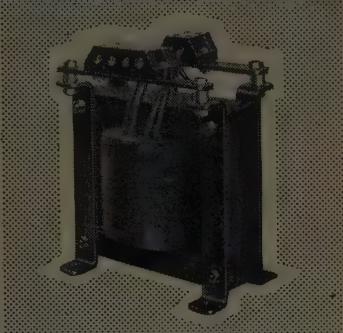


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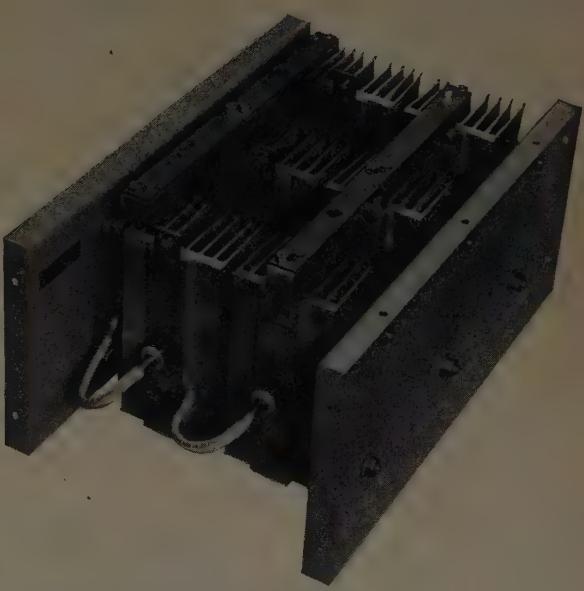
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Quality and price are important considerations. When you need high quality rectifiers at low prices we can supply your needs.

May we tell you more about our range? An enquiry will bring full details.



25 kilowatt stack. 135 amperes  
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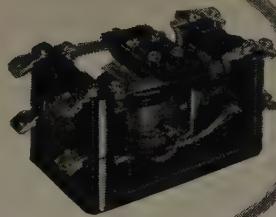
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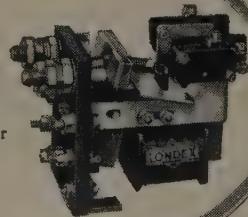
A miniature mercury switch relay. Rating up to 20A. S.P.D.T. Coils up to 110v D.C. or 250v A.C.

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A small relay with moulded base and insulators. Contacts up to 3 amps. T.P.D.T. Coils up to 165v D.C. or 450v A.C.

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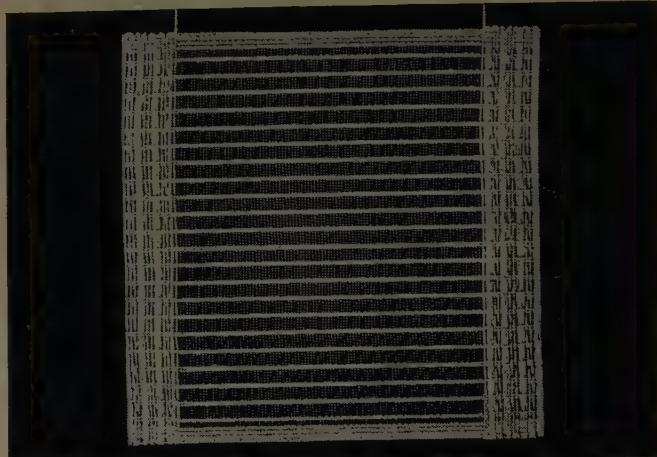
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## OFFICIAL NOTICES, TENDERS, ETC.

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#### Installation of Refrigerators

TENDERS are invited from experienced electrical contractors for the provision of electrical points, including all wiring fittings, etc., and the installation and testing of approximately 600 Refrigerators in Council Houses. The refrigerators will be supplied by the Council.

Tender documents may be obtained from the Engineer and Surveyor, Municipal Buildings, London Road, Camberley.

The Council does not bind itself to accept the lowest or any tender.

Tenders, in plain sealed envelopes, endorsed "Tender for the Installation of Refrigerators," must reach the undersigned not later than 12 noon on Monday, the 16th October, 1961.

K. S. HARVEY,  
Clerk of the Council.  
Municipal Buildings,  
London Road,  
Camberley, Surrey.

## SITUATIONS VACANT

(See "Replies to Box Numbers" above)

### CENTRAL ELECTRICITY GENERATING BOARD

#### South Thames Division

Dungeness Nuclear Power Station:  
Shift Charge Engineers  
(Staff Vacancy Notice No. 241/61)

APPLICATIONS are invited for the appointment of five Shift Charge Engineers for Dungeness Nuclear Power Station.

Applicants should have had extensive experience of the commissioning and operation of modern power station plant, together with experience of administration and the control of labour.

Experience of the operation of nuclear power station plant is not essential as adequate training can be given to successful applicants before taking up their appointments.

Applicants should be qualified for admission to corporate or graduate membership of a senior engineering institution.

The salaries for these posts will be in accordance with the National Joint Board Agreement, Schedule A, Class N, Grade 6, £1,795 to £1,950 per annum plus 10% shift allowance.

Applications stating age, qualifications, experience, etc., should be addressed to:—

Personnel Officer,  
Central Electricity Generating Board,  
South Thames Division,  
Lower Ham Road,  
Kingston-upon-Thames, Surrey,

to arrive by 25th October, 1961.

### EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments. Applicants should state age, qualifications, experience, etc., and quote the appropriate vacancy number.

#### Lincolnshire Sub-Area

DISTRICT COMMERCIAL ENGINEER,  
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(Vacancy No. 116/61).

Salary N.J.B. Class E, Grade 3, £1,275 to £1,410 per annum with progression to Grade 2.

The District is operated as a double-headed organisation and the successful candidate will be responsible for all the District commercial activities.

The duties will include responsibility for the negotiations for the supply of electricity to consumers, street lighting matters, advice on tariffs, electrical installations and appliances, sales activities, control of service centres and consumer service, the preparation of specifications and estimates for electrical installations, and the supervision of contracting work.

Candidates should hold the Higher National Certificate in Electrical Engineering or an equivalent qualification.

The successful candidate will be required to live in or near to Spalding, and the ability to drive a car is essential.

Applications should be forwarded to the Manager, Lincolnshire Sub-Area, North House, Grantham, Lincs., by the 20th October, 1961.

#### Northamptonshire Sub-Area

THIRD ASSISTANT ENGINEER  
(Substations)  
(Vacancy No. 118/61).

Salary N.J.B. Class K, Grades 9 to 11, £1,040 to £1,325 per annum, depending on the experience and qualifications of the successful candidate.

The duties will include assisting in the organisation and supervision of construction and equipment of substations up to 33 kV.

Applications should be forwarded to the Manager, Northamptonshire Sub-Area, 25, Bridge Street, Northampton, by the 20th October, 1961.

#### Mansfield and North Nottinghamshire Sub-Area

GENERAL ASSISTANT ENGINEER  
(Draughtsman)  
(Vacancy No. 119/61).

Salary N.J.B. Class L, Grade 15, £825 to £940 per annum.

The duties will include the preparation of engineering drawings, substation design and layout plans.

Applications should be forwarded to the Manager, Mansfield and North Nottinghamshire Sub-Area, Lime Tree Place, Mansfield, Notts., by the 20th October, 1961.

Advertisements are accepted up to first post on Monday of the week of issue

If blocks, bold type or ruled borders are required then on Friday prior to week of issue

All communications to be addressed to: Classified Advertisement Department, ELECTRICAL REVIEW  
Dorset House, Stamford Street  
London, S.E.1

Original testimonials should not be sent with applications for employment

### CENTRAL ELECTRICITY GENERATING BOARD

#### North Eastern Region

Steam Testing Department:  
Assistant Instrument Engineer

APPLICATIONS are invited from suitably qualified technicians for the position of Assistant to the Instrument Engineer in Dunston Power Station, Dunston-upon-Tyne.

Candidates shall have served a recognised apprenticeship and have some relevant experience of manufacture, commissioning or maintenance of instruments or control equipment for boiler, turbine or chemical process plant.

Applicants should possess an Ordinary National Certificate in Mechanical or Electrical Engineering as a minimum qualification.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Grade 12, Class K (£965-£1,090 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern Region, 1, Whitehall Road, Leeds, 1, to whom they should be returned to arrive not later than 13th October, 1961.

2500

### THE BRITISH ELECTRICAL & ALLIED MANUFACTURERS' ASSOCIATION

APPLICATIONS from men aged not more than 30 are invited for the post of ASSISTANT in a department at Ascot largely concerned with heavy rotating plant. The main requirements are a good education, an ability to write clearly, intelligence, and an agreeable manner.

The successful candidate would be expected, after an initial familiarisation with the background of the department's work, to attend committee meetings, record proceedings and work on the documents produced.

A technical qualification is not essential, but a background knowledge of the heavy side of the electrical industry could be an advantage. Sufficient interest in this field is essential to enable the holder of the post to handle technical terms with understanding.

A salary will be paid commensurate with qualifications and experience.

The post is permanent and pensionable.

Applications should be addressed to the Establishments Officer, BEAMA, 36, Kingsway, London, W.C.2.

2490

2501

2529

## Situations Vacant (continued)


**MIDLANDS  
ELECTRICITY  
BOARD**

APPLICATIONS are invited for the following superannuable posts:—

**Headquarters**
**THIRD ASSISTANT ENGINEER  
(Communications)  
(Chief Engineer's Department).**

Duties will cover work associated with the design, development, operation and maintenance of wired and radio telephone communications and control systems, together with similar work on other associated electronic and light current equipment. Technical qualifications desirable. Salary within the range £1,285/£1,610 per annum according to qualifications and experience (N.J.B. Schedule B, Grade 6 BX).

Apply by letter within 14 days, stating age, experience, present position and salary, to the Secretary, Midlands Electricity Board, P.O. Box No. 8, Mucklow Hill, Halesowen, near Birmingham.

**Birmingham Area**
**ENGINEERING DRAUGHTSMAN  
(General Assistant Engineer)  
(Area Office).**

Applicants should have experience in the preparation of drawings in connection with the layout of high-voltage and medium-voltage switchgear, cables, etc., and preparation of mains records for an extensive high-voltage and medium-voltage overhead and underground distribution system. Salary within the ranges £765/£870, £825/£940, £890/£1,015, £965/£1,090, £1,040/£1,165 per annum (N.J.B. Grade N.18 to 14), according to qualifications and experience.

**DRAUGHTSMAN (Area Office).**

Duties will include the preparation of plans and sketches and compilation of cartographic mains records. Salary £780/£880 per annum (N.J.C. Grade 3).

Apply by letter within 7 days, stating age, experience, qualifications, present position and salary, to Emil Braathen, Area Manager, Midlands Electricity Board, 14, Dale End, Birmingham, 4.

**North Staffs. Area**
**FOURTH ASSISTANT ENGINEER.**

The appointment is for shift duties in the Stoke-on-Trent Common Service Control Centre, The Parkway, Hanley. The successful applicant will be required to assist the Distribution Shift Control Engineer in the operation of the area transmission and distribution system. Applicants should have a knowledge of system operation and loading. Experience in the operation of supervisory controlled substations would be an advantage. Technical qualifications desirable. Salary £965/£1,090 per annum, plus 10% shift enhancement (N.J.B. Grade L.13).

Apply by letter within 10 days, stating age, experience, present position and salary, to Mr. C. C. Pimble, Area Manager, Midlands Electricity Board, 234, Victoria Road, Fenton, Stoke-on-Trent.

**Worcestershire Area**
**FIRST ASSISTANT DISTRICT  
ENGINEER (Worcester and Malvern).**

Applicants should have had experience in all branches of District work, including the planning of H.V. and L.V. distribution systems, and the operation and maintenance of high and low-voltage cables, switchgear and transformers. Technical qualifications desirable.

Salary £1,190/£1,325 per annum (N.J.B. Grade F.5).

Apply by letter within 14 days, stating age, qualifications, experience, present position and salary, to Mr. R. Mallet, Area Manager, Midlands Electricity Board, P.O. Box No. 52, Blackpole Road, Worcester.

**THIRD ASSISTANT DISTRICT  
COMMERCIAL ENGINEER  
(Evesham).**

Applicants should have had experience in contracting work, including the preparation of estimates, and in the sale and installation of electrical apparatus. Technical qualifications desirable. Salary £825/£940 per annum (N.J.B. Grade F.10).

Apply by letter within 10 days, stating age, experience, present position and salary, to District Manager, Midlands Electricity Board, 64, High Street, Evesham.

F. W. CATER,  
Secretary.

2510

**BRISTOL COLLEGE OF SCIENCE  
AND TECHNOLOGY**

Ashley Down, Bristol, 7

**Department of Electrical Engineering**

THE Governors invite applications for post of LECTURER to teach heavy current subjects in courses leading to Diploma in Technology, I.E.E. Part III, and Higher National Diploma.

Candidates must hold appropriate academic and/or professional qualifications, and should have had teaching, industrial and/or research experience.

Salary within range £1,370-£1,550 p.a. (This may be adjusted on introduction of new scales for Colleges of Advanced Technology.)

Application forms and details from the Registrar. When applying, please quote reference CST.61/35.

2495

**TECHNICAL OFFICER:  
PRISON COMMISSION**

PENSIONABLE post in London as Assistant to the Vocational Training Officer for men at least 26 on 1.8.61. Qualifications: O.N.C. (or equivalent) in engineering, and apprenticeship plus at least 3 years' industrial experience. Teaching experience an advantage.

Starting salary (Inner London) £882 (at 26) to £939 (at 28 or over). Scale maximum £1,043. Promotion prospects.

Write Civil Service Commission, 17, North Audley Street, London, W.1, for application form, quoting S/5392/61. Closing date 26th October, 1961.

2493

**ELECTRICAL ENGINEER  
(ASSISTANT)**

required, preferably aged between 22 and 30, for major development projects. The work consists of the design and installation of distribution and control systems for mechanical handling plant in the roadstone and quarrying industry.

Applicants should have a thorough knowledge of automatic control systems, and experience in the quarry or iron and steel industries would be an advantage.

The company operates works throughout the country and some travelling would be involved for which a car would be provided.

Written applications giving full particulars should be made to the Development Director, Tarmac Roadstone Ltd., Ettingshall, Wolverhampton.

2482

**YORKSHIRE ELECTRICITY BOARD**
**No. 3 (Sheffield) Sub-Area  
SHEFFIELD DISTRICT**
**ASSISTANT ENGINEER (Consumers).**

This post is within the Commercial Department of a large and important District offering good opportunities for experience and advancement. A knowledge of tariffs and their appropriate application and experience in negotiating with consumers for new and additional supplies and general load development, including in particular development of the space heating load, would be an advantage. The successful applicant must be able to control engineering staff and workpeople.

Salary N.J.B. Class L, Grade 11 (Scale 9), £1,115/£1,245 p.a.

**ROTERHAM AND MEXBOROUGH  
DISTRICT**
**ASSISTANT CONSUMERS' ENGINEER  
(Two Posts).**

Applicants should have had a sound practical training in the electricity supply industry. They should be conversant with I.E.E. regulations and also with statutory regulations applicable to electricity supplies. They should have had experience in negotiations with all types of consumers requiring electricity supplies, with tariff applications, load development and control of staff.

Salary N.J.B. Class K, Grade 12 (Scale 7), £965/£1,090 p.a.

Applications, together with the names of two referees, should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Change Alley, Sheffield, not later than 20th October, 1961.

**No. 1 (Bradford) Sub-Area  
BRADFORD DISTRICT**
**ASSISTANT CONSUMERS' ENGINEER.**

Candidates should be capable of preparing specifications in respect of lighting, heating and power installations and of dealing with consumers' queries regarding the application of electricity for domestic, commercial and industrial purposes.

Salary N.J.B. Class K, Grade 12 (Scale 7), £965/£1,090 p.a.

Applications, together with the names of two referees, should be sent to the Manager, No. 1 (Bradford) Sub-Area, Yorkshire Electricity Board, 45-53, Sunbridge Rd, Bradford, 1, not later than 20th October, 1961.

2533

**CITY AND COUNTY OF  
NEWCASTLE UPON TYNE TRANSPORT  
AND ELECTRICITY UNDERTAKING**
**APPLICATIONS are invited for the appointment of ASSISTANT ELECTRICAL  
ENGINEER in the Electricity Department.**

Candidates should have experience in the electricity supply industry, preferably in the operation and maintenance of high-tension and low-tension distribution systems, including mercury arc rectifier substations and rotary converter substations.

The salary is A.P.T. II (£815-£960 per annum) and the appointment is subject to the provisions of the Local Government Superannuation Acts and to the passing of a medical examination.

Applications stating age, experience, position held, etc., together with copies of three recent testimonials and endorsed "Assistant Electrical Engineer," should be addressed to the undersigned and received not later than Monday, 16th October, 1961.

FRANK S. TAYLOR,  
General Manager.  
Manors,  
Newcastle upon Tyne, 1.  
27th September, 1961.

2492

**COURTAULDS****Turbine Engineer**

COVENTRY BASED

COURTAULDS has a vacancy in its Engineering Headquarters, Coventry, for an Engineer experienced in erection, operation and maintenance of medium sized industrial steam turbines of condensing, pass-out and back pressure types.

He will be based on Coventry, servicing approximately forty machines of various types in the Group.

Knowledge of other heavy plant, such as air and gas compressors and refrigerating plant an advantage.

Candidates should write for a detailed form of application to the Director of Personnel, Courtaulds Limited, 16 St. Martin's-le-Grand, London, E.C.1, quoting reference number B.68/2.

2489

**CENTRAL ELECTRICITY GENERATING BOARD**

South Eastern Region, North Thames Division

APPLICATIONS are invited for the following appointments:

**GENERAL ASSISTANT ENGINEER,**  
BRADWELL (Nuclear)  
GENERATING STATION (Essex)  
(S.V. No. 1513).

Salary N.J.B. Class M, within the range of Grades 20-17, Scales, 1-4, £625-£870 per annum, plus £90 per annum shift allowance when required to work on shift. The commencing salary will depend upon the duties and responsibilities.

The duties associated with this post will include assisting in the operation of nuclear reactors and conventional turbo alternating plant. Plant testing and maintenance work.

Previous experience in a generating station and technical training to the standard of Ordinary or Higher National Certificate or the equivalent will be an advantage.

Applications, quoting reference S.V. No. 1513, stating age, qualifications, experience and present position should be sent to the Personnel Officer, Central Electricity Generating Board, South Eastern Region, North Thames Division, West Farm Place, Chalk Lane, Cockfosters, Barnet, Herts., to arrive not later than 14th October, 1961.

F. W. SKELCHER,  
Assistant Regional Director.

2520

**MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD**

**FOURTH ASSISTANT ENGINEER** (Planning) required at No. 1 Sub-Area Headquarters, Liverpool. Salary within range £1,040-£1,165 per annum (N.J.B. Class M, Grade 13).

Applicants should have had sound training in all aspects of the distribution of electricity, and have a knowledge of the technical and economic principles underlying the design of distribution systems. The possession of suitable technical qualifications is desirable.

Appointment subject to medical examination. Pension scheme.

Special application forms, obtainable from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, should be returned not later than 23rd October, 1961.

Previous applicants need not re-apply.

2515

**ATTRACTIVE VACANCY**  
for  
**EXPERIENCED ELECTRICAL**  
**MACHINE DESIGNER**  
in  
**AUSTRALIA**

**CAPABLE** of designing and developing both A.C. and D.C. machines of up to 500 h.p.

The post is Assistant Design Engineer to the Chief Electrical Engineer of an Australian company situated Melbourne, which designs and manufactures a large range of rotating electrical equipment.

Good technical qualifications and design experience essential.

Commencing salary £2,500 per annum (Australian), depending on ability and experience.

Excellent prospects of advance to Chief Electrical Engineer of the company in the future.

Applications in writing giving details of training and experience, positions held, etc., to:

The General Manager  
**THE ELECTRIC CONSTRUCTION COMPANY LIMITED**  
Bushbury Engineering Works  
Wolverhampton

2538

**SOUTH EASTERN ELECTRICITY BOARD**

**ASSISTANT DISTRICT ENGINEER,**  
Croydon and Purley District.

Salary £1,165-£1,295 per annum, including London allowance, under N.J.B. Agreement, Class J, Grade 9. Superannuable. Applicants should be suitably qualified and have operational experience of maintenance and construction on distribution systems up to 11 kV. Candidates should also have experience of planning work.

Applications, quoting ER and naming 2 referees, on forms from District Manager, SEEBOARD, Electric House, Wellesley Road, Croydon, by 18th October, 1961.

**ASSISTANT DISTRICT ENGINEER,**  
Sutton District.

Salary £1,115-£1,245 per annum plus London allowance under N.J.B. Class G, Grade 7. This District (77,000 consumers) covers a dense urban area on the outskirts of London. Applicants, of good general education, should have had technical training to Higher National Certificate standard, with practical experience of general distribution work, and be capable of carrying out planning, construction and maintenance work. Consideration will be given to a private car allowance and, in appropriate circumstances, to assistance with housing.

Applications, quoting ER, on forms from District Manager, SEEBOARD, 52, High Street, Sutton, by 18th October, 1961.

GEORGE WRAY,  
Secretary.

2524

**SOUTH OF SCOTLAND ELECTRICITY BOARD**

**APPLICATIONS** are invited for the superannuable position of **MECHANICAL MAINTENANCE ENGINEER** at HUNTERSTON NUCLEAR GENERATING STATION, near Largs, Ayrshire.

The successful candidate will be directly responsible to the Maintenance Superintendent for all maintenance of mechanical plant at the station. Candidates should have served a recognised apprenticeship and have had experience in organising and carrying out maintenance programmes. Minimum technical qualification required will be a Higher National Certificate. Specialised nuclear training will be arranged for the successful applicant.

Salary N.J.B. Class M, Grade 6, £1,650/£1,830 per annum.

Applications, quoting reference No. G28/61, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 20th October, 1961.

2539

**MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD**

**DEMONSTRATOR** (Female) required in the Board's No. 2 Sub-Area to be based at St. Helens. Salary within range £600-£700 per annum (N.J.C. Grade 1) according to experience and qualifications. Staff conditions of service, including holiday, sick pay and pension schemes.

Applicants should possess the E.A.W. Demonstrator's Certificate or other qualification, and should preferably have had training and experience in the use and demonstration of electric cookers and other domestic electrical appliances.

The post is active and interesting, and involves wide contact with the public, particularly housewives, women's organisations and schools.

Appointment subject to medical examination.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway House, Northwich, Cheshire. Closing date 20th October, 1961.

2526

## Situations Vacant (continued)

## A SALES ENGINEER

having experience of temperature control application is required by

### THE RHEOSTATIC COMPANY LIMITED Slough Bucks

The successful applicant will be responsible for dealing with customers' technical enquiries by telephone and letter. He will, therefore, require experience in handling technical sales correspondence. An essential facet of his duties will be the production of wiring diagrams in rough form and advising customers of the correct applications of the temperature control for heating systems, and this will call for a sound technical level of the order of H.N.C. Electrical.

This is a permanent and pensionable post arising from the promotion of the present incumbent, and applications should be made to the Personnel Manager.

2544

## SOUTHERN ELECTRICITY BOARD

## Meter Engineer

Sub-Area Engineering Department of No. 1 (Southall) Sub-Area, located at Waterloo Road, Uxbridge. Salary N.J.B. Class M, Grade 5 (£1,795-£1,950 per annum, plus £60 London allowance). N.J.B. conditions of service.

The successful candidate will be responsible to the Sub-Area Engineer for the administration and control of the Sub-Area Meter Testing Station and to supervise all meter work throughout the Sub-Area. Candidates should be Corporate Members of the I.E.E. or possess equivalent qualifications. They must have a sound knowledge of all matters relating to meter engineering, including statutory requirements, and must be fully experienced in the operation of modern Class A stations dealing with all types of A.C. and D.C. meters, demand indicators, instruments, time switches, instrument transformers and protective relays.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, quoting Z.1414, not later than 16th October, 1961.

## Assistant Engineer (Planning)

Oxford District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class K, Grade 10 (£1,115-£1,245 per annum). N.J.B. conditions of service.

The duties of the post will be to assist the Planning Engineer in the preparation of schemes and estimates for extensions of and reinforcement to overhead and underground H.V. and L.V. networks. Applicants should possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks., and returned to him, quoting Z.1415, not later than 16th October, 1961.

## Shift Engineer

Melksham District of No. 2 (Newbury) Sub-Area, located at Hawthorn (Quarry) Site, Corsham. Salary N.J.B. Class G, Grade 12 (£765-£870 per annum, plus a shift allowance at present £90 per annum). N.J.B. conditions of service.

The duties of the post will be to supervise manual staff employed on the maintenance of H.V. and L.V. networks and plant, and to be

responsible to the senior engineer for the operation and control of such networks and plant.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks., and returned to him, quoting Z.1417, not later than 16th October, 1961.

## Service Representative

Bournemouth District of No. 4 (Bournemouth) Sub-Area, located at the New Milton Branch. Salary N.J.C. Grade 2 (£700-£775 per annum). N.J.C. conditions of service.

Candidates should possess the ability to advise on supply matters, tariffs, apparatus and sales to consumers with domestic or small commercial or industrial installations.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, quoting Z.1413, not later than 16th October, 1961.

## Demonstrator

Portsmouth District of No. 3 (Portsmouth) Sub-Area. Salary N.J.C. Grade 1 (£600-£700 per annum). N.J.C. conditions of service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus, and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent domestic science qualifications would be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1357, not later than 16th October, 1961.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

2534

CENTRAL ELECTRICITY  
GENERATING BOARD

## Midlands Region

## East Midlands Division

ASSISTANT SHIFT CHARGE  
ENGINEER, LEICESTER POWER  
STATION (Vacancy No. 216/61).

Applications are invited for the position of Assistant Shift Charge Engineer at the Leicester Power Station, Raw Dykes Road, Leicester.

Applicants should have received a sound technical training and have experience in a modern power station. Preference will be given to candidates who possess a Higher National Certificate or its equivalent.

Salary will be in accordance with Class G, Grade 9 (£965-£1,090 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 13th October, 1961.

FIRST ASSISTANT STATION CHEMIST,  
DERBY POWER STATION  
(Vacancy No. 217/61).

Applications are invited for the position of First Assistant Station Chemist at Derby Power Station, Sowter Road, Derby.

Previous experience in a power station laboratory is essential and candidates should preferably be Associates of the Royal Institute of Chemistry or hold an equivalent qualification. Candidates must be familiar with the methods of sampling and analysis of coal, oil and water and with the interpretation and application of the analytical results. Experience with problems arising from high-pressure, high-temperature operation and of the solution of such problems is desirable.

Salary will be in accordance with Class F, Grade 9 (£890-£1,015 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 13th October, 1961.

GENERAL ASSISTANT ENGINEER  
(Chemist),  
SPONDON POWER STATION  
(Vacancy No. 222/61).

Applications are invited for the position of General Assistant Engineer (Chemist) at Spondon Power Station, near Derby.

Candidates must have had a sound technical training and previous laboratory experience, and should preferably hold the Higher National Certificate in Chemistry, but consideration will be given to candidates studying for that qualification.

Salary will be in accordance with Class J, Grade 14 (£765-£870 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 20th October, 1961.

GENERAL ASSISTANT ENGINEER  
(Efficiency and Planning),  
WILLINGTON "A" & "B"  
POWER STATIONS  
(Vacancy No. 223/61).

Applications are invited for the position of General Assistant Engineer in the Efficiency and Planning Department at Willington "A" and "B" Power Stations, P.O. Box No. 27, Derby. Candidates should have the minimum qualification of an Ordinary National Certificate in Mechanical or Electrical Engineering and should have an understanding of the problems involved in modern power station operation.

The salary will be within Class M, Grade 16 (£825-£940 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 20th October, 1961.

These appointments are pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AB6/ACT, which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

O. S. WOODS,  
Assistant Regional Director.

2536

SOUTH OF SCOTLAND  
ELECTRICITY BOARD

## Edinburgh and Borders Area

THIRD ASSISTANT ENGINEER (Planning  
and Development), Area Headquarters,  
Dewar Place, Edinburgh.

Salary N.J.B. Schedule A, Class L, Grade 10,  
Salary Scale No. 10, £1,190/£1,325 p.a.

Applications, on the standard form, obtainable from the undersigned or any other Area Manager, should be submitted not later than 21st October, 1961.

Applicants for this superannuable appointment should have a sound engineering training and experience in the design and layout of densely loaded distribution networks in city areas and rural systems at pressures up to and including 33 kV; the application of modern protective equipment; and of the calculation and preparation of load flow diagrams and fault levels. Applicants must also possess as a minimum qualification a Higher National Certificate in Electrical Engineering or its equivalent.

Conditions of service will be in accordance with the National Joint Board Agreement for the Electricity Supply Industry. The successful candidate will require to reside within a reasonable distance of Area Headquarters.

C. H. A. COLLYNS,  
Manager.  
52, Melville Street,  
Edinburgh, 3.

2499

RTB

## RICHARD THOMAS &amp; BALDWINS LIMITED

SPENCER WORKS

Vacancies exist for

ASSISTANT  
ELECTRICAL ENGINEERS

at the integrated iron and steel plant now under construction at Llanwern, near Newport, Mon.

Successful candidates will be required to assist in the design, layout and commissioning of installations.

The range of specialisation is not rigid but preference will be given to applicants with some experience of steel works or other heavy industrial plant. This is a first-class opportunity for young men holding a Higher National Certificate in Electrical Engineering and who are keen to widen their experience in the field of heavy electrical engineering, as there are a large number of new and interesting techniques incorporated in this plant.

Application forms, which should be returned by 18th October, can be obtained from

The Manager, Staff & Labour Relations Dept.  
RICHARD THOMAS & BALDWINS, LIMITED  
Spencer Works, Llanwern, Nr. Newport, Mon.

Please quote Ref. No. 202/1a in your letter of application.

2509

CENTRAL ELECTRICITY  
GENERATING BOARD

## Western Division

STATION SHIFT CONTROL ENGINEER (W/AV/92/61) required at Newton Abbot Power Station.

Superannuation scheme. Salary N.J.B. Class F, Grade 10, Scale 5, £825-£940 p.a. plus £90 shift allowance.

Candidates should possess good technical qualifications and should have had training and experience in the control and operation of steam generating plant and main switchgear.

ASSISTANT SHIFT CHARGE ENGINEER (W/AV/93/61) required at East Yelland Power Station.

Superannuation scheme. Salary N.J.B. Class J, Grade 8, Scale 10, £1,190-£1,325 p.a. plus 10% shift allowance.

Applicants should possess good technical qualifications and should have had training and experience in the control and operation of modern steam generating plant and main switchgear.

Applications on form AE6/ACT, obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed and returned by 16th October, 1961.

2535

MERSEYSIDE AND NORTH WALES  
ELECTRICITY BOARD

ASSISTANT CONSUMERS' ENGINEER required at Wrexham in the Board's No. 4 Sub-Area.

Salary within range £890/£1,015 per annum (N.J.B. H/11, Scale 6).

Applicants should have had engineering training, and some experience of rural development and public lighting and the general development of domestic and commercial load, including the organisation of promotional activities, exhibitions, etc. Experience in estimating and preparing specifications for contracting work would be an advantage.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity House, Rhostyllen, near Wrexham. Closing date 23rd October, 1961.

2525

## Eastern Electricity

## Chilterns Sub-Area

FOURTH ASSISTANT ENGINEER, LUTON DISTRICT (207/61.R). Candidates should have had a sound training in electrical engineering and experience in the construction, operation and maintenance of underground and overhead distribution systems, including substations.

Salary N.J.B. Class J, Grade 11 (£965-£1,090).

Apply by letter to the Manager, Luton District, Eastern Electricity Board, 487, Dunstable Road, Luton, by 20th October, 1961.

## Essex Sub-Area

GENERAL ASSISTANT ENGINEER (Draughtsman), SUB-AREA HEADQUARTERS (206/61.R). Duties include preparation of drawings of building and civil engineering work for offices, showrooms, 11 and 33-kV substations, etc., and applicants should be capable of carrying out site surveys.

Possession of the Ordinary National Certificate (Building) or equivalent qualifications will be an advantage.

Salary N.J.B. Class M, Grade 16 (£825-£940) plus £50 London allowance.

Apply by letter to C. C. Brazier, A.M.I.E.E., Engineer, Essex Sub-Area, Eastern Electricity Board, Millfield, Bentley, near Brentwood, Essex, by 20th October, 1961.

2531

## NORTH WESTERN ELECTRICITY BOARD

## Third Assistant District Engineer (Testing), West Lakeland District, Workington

Applicants should be capable of inspecting, testing and commissioning all kinds of switchgear, transformers, etc., and particularly must have an intimate knowledge of protective systems. Possession of the H.N.C. in Electrical Engineering will be an advantage.

Salary scale £965/£1,090 p.a., Grade G.9. N.J.B. conditions.

## Senior Demonstrators, Barrow-in-Furness, Workington and Carlisle

Duties will be actively to promote the sales of electrical energy and equipment. Experience must include extensive negotiations with public bodies, including education authorities, school meals services, domestic organisations and teachers. Experience of successful public speaking will be an advantage.

Salary scale £700 x £25 to £775 p.a., Grade 2. N.J.C. conditions.

Applications on forms to be obtained from the Manager, No. 6 Sub-Area, North Western Electricity Board, Castle Green, Kendal, and returned to him by 16th October, 1961.

2496

SOUTH EAST LONDON  
TECHNICAL COLLEGE  
Lewisham Way, London, S.E.4

ONE post of SENIOR LECTURER and several of LECTURERS are vacant in the Department of ELECTRICAL ENGINEERING. Candidates should be well qualified and have had industrial experience in one or more of the following subjects:—

- (a) Light-current Electrical Engineering.
- (b) Industrial Electronic Applications.
- (c) Instrumentation and Control.

The department offers full-time, "sandwich" and part-time day and evening courses.

Salary, within the present scales (at present under review):—

Senior Lecturer £1,588 x £50 to £1,801.  
Lecturer £1,408 x £35(4) and £40 to £1,601.

Application forms from Secretary, returnable within two weeks, stating for which grade or grades application is made. Please quote (FE.3a/R/2619/10).

2484

CENTRAL ELECTRICITY  
GENERATING BOARD

## South Eastern Region

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

ASSISTANT ENGINEER (Handling),  
BRUNSWICK WHARF  
POWER STATION  
(Vacancy No. 61/597).

Experience of coal and ash handling plant maintenance and operation. Control of unloading ships, arranging for coal and oil deliveries, and the removal of ash and dust will be part of the responsibilities. Salary Class K, Grade 8 = £1,325-£1,460 per annum.

Previous applicants will be considered.

Applications, quoting vacancy number, may be made to (or on form from) Personnel Department, Central Electricity Generating Board, P.O. Box No. 136, London, W.1, to be received not later than 10th October, 1961.

2497

## NORTH WESTERN ELECTRICITY BOARD

Second Assistant District Engineers,  
Central District, Manchester

THE duties will include the supervision of the erection and maintenance of substation switchgear, laying and jointing of cables, and switching operations on the H.V. and L.V. systems within the District as required. Applicants should have had a wide general experience on the distribution side of electricity supply and be prepared to undertake standby duties. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary scale £1,275/£1,410 p.a., Grade J.7. N.J.B. conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, North Western Electricity Board, Town Hall, Manchester, 2, P.O. Box 493, and returned to him by 16th October, 1961.

2512

## Situations Vacant (continued)

## ELECTRICAL ENGINEERING ASSISTANTS

required with experience in any of the following:-

- (1) Planning of electrical installations and preparation of specifications for new schools and other large buildings.
- (2) Preparation of schemes of repair and improvement of electrical installations in all classes of buildings.
- (3) Preparation of schemes and specifications for all types of electric lifts.
- (4) The operation of maintenance contracts and arranging for servicing works on electric lifts.

Applicants should be Corporate Members of the Institution of Electrical Engineers or hold some recognised technical qualification, e.g., National Certificate or Diploma of the A.S.E.E.

Up to £1,500 according to qualifications, age and experience. Pension scheme. Staff restaurant.

Forms from Chief Engineer (GS/E/2662/10), L.C.C., County Hall, London, S.E.1.

2485

## MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Board's No. 1 Sub-Area:-

ASSISTANT SECTION ENGINEER in the Liverpool South District. Salary within range £1,115/£1,245 per annum (N.J.B. J/9).

ASSISTANT SECTION ENGINEER in the Southport District. Salary within range £890/£1,015 per annum (N.J.B. F/9).

Applicants should have had technical training, and had operational experience of H.V. and L.V. networks including substations. Technical qualifications desirable.

Appointments subject to medical examination. Pension scheme.

Application forms may be obtained from the Manager, No. 1 Sub-Area, 24, Hatton Garden, Liverpool, 3, and should be returned not later than the 23rd October, 1961.

2527

## TRANSFORMER PRODUCTION ENGINEER

AN engineer is required for process development and production of transformers with a company in South-Eastern England. Applicants should have a sound experience in all branches of power transformer manufacture, preferably up to 30 MVA. Applications stating age, qualifications, experience and salary required to—Box 2476.

## CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

THIRD ASSISTANT ENGINEER is required in the Stourport District of the Electrical Department. N.J.B. service conditions, superannuable appointment, salary in accordance with Grade L.8, £1,165/£1,500 per annum.

Applicants should have had experience in the operation and maintenance of high-voltage transmission lines, substations, transformers and heavy electrical equipment. A knowledge of protective gear, metering or telecommunications equipment would be an advantage, and applicants should preferably possess the Higher National Certificate in Electrical Engineering or equivalent qualification.

Apply, quoting Vacancy No. 257/61 MD, to Mr. S. S. Tyler, Stourport District Engineer, Stourport District Office, Worcester Road, Stourport-on-Severn, Worcs., by 16th October, 1961.

2498

## CORPORATION OF LONDON

## City Surveyor's Department

invite applications for permanent post of ELECTRICAL ENGINEERING ASSISTANT; salary scale £1,055 to £1,310.

Candidates should be Graduate Members of the Institution of Electrical Engineers and have had experience in preparation of schemes for electrical lighting, heating and power installations in public buildings, electric lifts and small ventilating schemes, and the maintenance of existing services.

## Local Act Superannuation.

Applications, stating age, previous appointments and experience, with names of two referees, to City Surveyor, Guildhall, London, E.C.2, within 14 days.

2540

## COVENTRY CORPORATION

ASSISTANT HEATING AND VENTILATING ENGINEER, Grade A.P.T. III/IV, £960-£1,310, commencing according to qualifications/experience, to be responsible for design and contract supervision of heating, ventilating, air conditioning and other building services in a varied and interesting building programme. Associate Membership Inst.H. & V.E. desirable.

Housing accommodation may be available. Interest-free removal expenses loan up to £50.

Application forms from City Engineer, Council House, Coventry, returnable by 16th October, 1961.

2545

## SURREY EDUCATION COMMITTEE

## Wimbledon Technical College, Gladstone Road, London, S.W.19

REQUIRED 1st January: LECTURER in ELECTRICAL ENGINEERING with special reference to control systems; should have good teaching and industrial experience, and be prepared to teach to H.N.C. level and be responsible for servo mechanisms.

Salary Burnham Technical Scale for Lecturers, £1,370-£1,550 per annum, plus London allowance.

Application form and further particulars from Principal, to be returned within two weeks.

2477

## CITY OF OXFORD EDUCATION COMMITTEE

## College of Technology

## School of Electrical Engineering

APPLICATIONS are invited for the post of A LECTURER IN ELECTRICAL ENGINEERING, to commence duties in January, 1962.

Candidates should possess a good degree in electrical engineering or physics and/or be Corporate Members of the Institution of Electrical Engineers. An interest in measurements, coupled with teaching experience and recent industrial experience are additional recommendations.

Salary at present £1,370 x £35 (4) x £40 to £1,550.

Further particulars and a form of application (stamped addressed envelope) may be obtained from the Principal, College of Technology, Headington Road, Oxford, to whom completed forms should be returned by 15th October, 1961.

2523

## SOUTH WALES ELECTRICITY BOARD

## General Assistant Engineer (Architectural Assistant)

APPLICATIONS are invited for the position of GENERAL ASSISTANT ENGINEER (Architectural Assistant) in the Chief Engineer's Department at Head Office, St. Mellons.

Salary N.J.B. Class J, Grade 12, Scale 6, £815-£1,015 per annum. The successful applicant will receive a commencing salary of at least £890 per annum.

Applicants should preferably be of Intermediate R.I.B.A. standard.

Applications stating age, present position, present salary, qualifications and experience should be addressed to the undersigned at St. Mellons, Cardiff, to arrive not later than 21st October, 1961. Please quote reference 119/61/ER, endorsing envelope "General Assistant Engineer (Architectural Assistant)."

R. G. WILLIAMS,  
Secretary.

2503

## ELECTRICAL DRAUGHTSMAN

required by NORTH THAMES GAS BOARD at WESTMINSTER.

Applicants should possess O.N.C. (Electrical) and should have experience in the preparation of drawings and specifications for electrical work, preferably of the low-current type. Experience also required in the servicing of tele-metering equipment in the field and in the use of standard testing apparatus. A knowledge of switchgear protection and the ability to carry out routine tests would be an advantage.

Starting salary within the range £850 to £1,135 per annum according to experience.

Applications should be sent to the Staff Controller, North Thame Gas Board, 30, Kensington Church Street, London, W.8, quoting reference ER/1008.

2528

## DORMAN &amp; SMITH LIMITED

require ELECTRICAL DESIGN ENGINEERS with experience of low and medium-voltage electrical distribution practice. Successful applicants will be of approximately H.N.C. standard and have worked for some time on the design of electromechanical devices.

Remuneration will be considerably in excess of A.E.S.D. rates.

Apply to:-

The Secretary  
Dorman & Smith Limited  
Atherton Works, Preston, Lancs.

2467

R. G. WILLIAMS,  
Secretary.

2530

# ENGLISH ELECTRIC

## TECHNICAL AUTHORS

The Aircraft Equipment Division of the Company at Bradford requires the services of several engineering authors to prepare maintenance and user handbooks for their products. These cover complete aircraft control systems, electric, electro-mechanical and hydraulic power systems and generators, (A.C. and D.C.) actuators, encapsulated motors for G.W. use, etc. This equipment incorporates many new and unusual devices, such as brushless alternators, 400 cycle generation, transistorized control circuits, etc.

Applicants should preferably possess a minimum qualification to H.N.C. level and must have a good knowledge of circuitry. Previous knowledge of technical writing would be an advantage, but the main requirement is an ability to express technicalities in everyday language. These vacancies would be of interest to people recently engaged on handbook preparation in the Services.

Please reply, giving full details of experience and qualifications to the TECHNICAL PERSONNEL OFFICER, c/o DEPT. G.P.S., ENGLISH ELECTRIC HOUSE, STRAND, LONDON, W.C.2 quoting reference number ER 2928.

2481

### KAMPALA MUNICIPAL COUNCIL, UGANDA, EAST AFRICA

WORKS SUPERVISOR (Electrical) required in scale £1,143-£1,671, plus 6% gratuity on completion of contract of 21/27 months; 4 months' paid leave and air passages for officer and family after two years; provident fund (adds 7½% to salary); housing at nominal rent; medical and dental benefits; car loan and allowances; good climate and conditions.

Applicants must have served a 5-year apprenticeship with a recognised electrical undertaking or company and hold the Ordinary National Certificate (Electrical) or equivalent qualification. Works training and experience in maintenance and repair of S.G.E. and/or A.T.E. vehicular-actuated traffic signals essential.

The duties are principally on the installation and maintenance of the vehicular-actuated traffic signals; also on the installation, maintenance and repair of the normal electrical systems and plant of a local authority.

Apply, giving age and 2 referees, to the Town Clerk, P.O. Box 210, Kampala, Uganda, by 21st October, 1961. Canvassing disqualifies.

2439

### OVERHEAD TRANSMISSION LINE ENGINEERS

A GENTS, SUB-AGENTS & ENGINEERS required for 275-kV and 132-kV steel tower line contracts in Scotland.

State age and give full details of experience in confidence to Box No. 994, Keith & Co., 11, Castle Street, Edinburgh.

2542

To expand an active development team

**BRYCE**

require a

### DEVELOPMENT ENGINEER

to work on interesting projects concerned with the manufacture of power transformers and capacitors.

Applications are invited from qualified engineers who have experience in either transformer or capacitor manufacture. Minimum standard required: Graduate Membership I.E.E.

Reply to:—

The Technical Director  
**BRYCE ELECTRIC CONSTRUCTION  
CO. LTD.**  
Kelvin Works, Hackbridge, Surrey

2383

### CENTRAL ELECTRICITY GENERATING BOARD

#### West Midlands Division

STATION ASSISTANT SHIFT CONTROL ENGINEER is required at Stourport "A" and "B" Power Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule A of the Agreement, Grade K.12, £965-£1,090 per annum, plus 10% for shift duties.

A sound technical training and practical experience in the control of steam generating plant and main switchgear are required. Appropriate technical qualification an advantage.

Apply quoting Vacancy No. 259/61 MD, on form AE6, available from the Station Superintendent, Stourport Power Station, Severn Side, Stourport-on-Severn, Worcs., by 16th October, 1961.

2532

### MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER required in the Chester District of the Board's No. 3 Sub-Area. Salary within range £1,115/£1,245 per annum (N.J.B. J/9).

Applicants should have had experience in the construction and operation of overhead and underground distribution systems up to 33 kV, including indoor and outdoor substation equipment, and be in possession of appropriate technical qualifications.

Appointment subject to medical examination. Pension scheme.

Applications, on forms obtainable from the Manager, No. 3 Sub-Area, Electricity House, Newgate Street, Chester, must be forwarded not later than 23rd October, 1961.

2514

### SOUTH WALES SWITCHGEAR LIMITED

#### Technical Sales Engineers

S.W.S. have vacancies for Outside Sales Engineers to operate in the North West Area.

One is required to deal with electricity board work and another to call on industrial concerns.

Preference will be given to applicants who possess at least the H.N.C. in Electrical Engineering, and have served a recognised apprenticeship course. Some experience in switchgear manufacture is essential.

Applications giving full particulars of training, technical qualifications, age and salary expected should be addressed to the Home Sales Manager, South Wales Switchgear Ltd., Rex Buildings, Wilmslow, Cheshire, and mark the envelope "Confidential."

2541

### ABERDARE CABLES LTD.

MANUFACTURERS of paper and plastic-insulated cables require an ELECTRICAL ENGINEER to take control of their development department. This will be a senior position responsible directly to the Chief Engineer.

Applicants must possess an engineering degree, have had some cable experience, and preferably some knowledge of experimental techniques. Age 28-32.

Apply by letter, in strict confidence, giving complete details of technical qualifications, experience and salary, to the Secretary, Aberdare Cables Limited, Aberdare, Glamorgan.

2537

### NORRIS CONSULTANTS LIMITED

require in the Bristol and Reading offices

#### ELECTRICAL ENGINEERS. ELECTRICAL DESIGNER/DRAUGHTSMEN.

Applications are invited from engineers and draughtsmen with experience in building installations, distribution and control equipment.

Send full details, quoting reference M.R.N., to Beacon House, Queen's Road, Clifton, Bristol, 8.

2494

### TRINIDAD AND TOBAGO ELECTRICITY COMMISSION

WEST INDIAN Engineers who are interested in careers with the Trinidad and Tobago Electricity Commission are invited to write to the Secretary and Personnel Manager, P.O. Box 121, Port-of-Spain, Trinidad, West Indies.

There are good opportunities for young West Indian nationals with degrees in Electrical or Mechanical Engineering or who are Graduate Members of the Institution of Electrical Engineers.

Commencing salary £1,050 per annum.

Experience not necessary, but candidates MUST be qualified.

2345

### CENTRAL ELECTRICITY GENERATING BOARD

#### South Thames Division

#### Kingston Power Station

ASSISTANT ENGINEER (Technical) (Vacancy No. 225A/61). A vacancy exists for a qualified engineer who is interested in carrying out investigations into power station performance with particular emphasis on the handling and combustion of low-grade fuel. He will be directly responsible to the Operation Superintendent.

Salary N.J.B. Class G, Grade 11, £875-£990 per annum, including London allowance.

Applications, giving age, details of qualifications, experience, etc., should be sent to the Station Superintendent, Kingston Power Station, Downhall Road, Kingston-on-Thames, Surrey, to arrive by 16th October.

2521

CLASSIFIED ADVERTISEMENTS  
ARE PREPAID

## Situations Vacant (continued)

## ELECTRICAL DESIGN ENGINEER

THE HARLAND ENGINEERING Co. Ltd., ALLOA, has a vacancy for an ELECTRICAL DESIGN ENGINEER with 3 to 4 years' experience in the design of A.C. or D.C. machines. The work is varied and interesting.

Applicants should have a good H.N.C. or Degree in Electrical Engineering.

Full details of experience and technical qualifications to Personnel Manager.

2491

## CITY OF NOTTINGHAM

## City Engineer's Department

## Assistant Electrical Engineer

APPLICATIONS are invited for the above position in the City Engineer's Department in Grade A.P.T. 3 (£960-£1,140 p.a.). Starting salary will depend on qualifications and experience.

Applicants must have the ability to design electric lighting and power installations for new buildings. The work in the office is on a five-day week basis.

Applications on forms to be obtained from the City Engineer and Surveyor, Guildhall, Nottingham, must be returned to him not later than Wednesday, 18th October, 1961.

2511

OVERSEAS  
ELECTRICAL CONTRACTOR

requires BRANCH MANAGER for West Africa with contracting experience from enquiry to final account, and experience of controlling branch with turnover of £1 million.

Excellent conditions and prospects offered.

Applications in writing giving fullest details of past experience to—Box 2410.

## SENIOR TRANSFORMER DESIGNER

with experience of various types up to 5 MVA. This appointment carries a very realistic salary and scope for the future for the right man between 30-40.

A company house is available if required. Factory is situated in ideal rural surroundings four miles from the sea.

Apply Chief Designer, London Transformer Products Ltd., Bridgend, Glam.

206

## ELECTRICAL ENGINEERS

GRADUATES or those holding equivalent qualifications required for work on site in Northern Ireland on the supervision of construction, testing and commissioning of power station equipment.

Please apply stating full details of experience and salary required to—Kennedy & Donkin, Consulting Engineers, 64, Royal Exchange, Manchester 2.

2483

APPLICATIONS are invited by Kennedy & Donkin, 12, Caxton Street, London, S.W.1 (ref. RFL), for the post of assistant in the cable department at their Weybridge office. Applicants must be qualified electrical engineers with experience in design, manufacture and installation of cables for transmission and generation projects.

341

A GENT wanted for West Country and South Wales by manufacturers of small rotating electrical machines. Considerable preparatory work already done in the area.—Box 2502.

A SST. branch manager reqd. by elec. wholesale salers, Luton district. Must have good knowledge of the trade and administrative ability. Apply in writing to Secretary, L.E.C., 92, Blackfriars Road, London, S.E.1. 2478

A SSISTANT chief designer with experience in electric lamp making machinery required for London area. Salary £1,200 to £1,500 p.a., according to experience. Pleasant conditions, interesting work and generous pension scheme. Reply to—Box 2546.

BRITISH ENGINE BOILER & ELECTRICAL INSURANCE Co. Ltd., Longridge House, Manchester, 4. Electrical surveyors required in England and Scotland. Permanent positions carrying progressive salary scales £4825 to £1,225, with non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. 2513

CABLE engineer required for the Midlands area capable of supervising cable laying and jointing contracts. An excellent opportunity for a man wishing to take charge of an area and work with a considerable amount of freedom. Pension scheme and car provided. Reply stating age, salary and experience.—Box 2407.

CONSULTING engineers require designer/draughtsmen experienced in the design of electrical services for Government projects, hospitals, schools, etc. Excellent promotion prospects in expanding practice. Write—Locke & Beal, 303/307, Balham High Road, London, S.W.17. 2405

CONTRACT engineers and electrical engineer. Well-known firm of engineers specialising in industrial instruments and automatic boiler and process control equipment, now installed in large modern factory in Surrey have a vacancy for an engineer with good technical training and education to at least Ordinary National Certificate standard, preferably with experience in instrumentation and capable of conducting contract correspondence; preparation of electrical/electronic wiring diagrams would be an advantage for electrical engineer. Applications stating age and experience to C.C.E.—Box 2547.

CONTRACTORS, senior and assistant engineers required by well-established firm, central London, for quality work of all types. Positions offer scope for advancement for capable and energetic engineers. Write fullest detail, in confidence, of experience, training, age and salary required.—Box 133.

ELC. wholesalers require clerical asst. with some knowledge of lighting equipment. Progressive position.—L.E.C., 92, Blackfriars Road, London, S.E.1. 2360

ELECTRICAL contracts engineers (2) required with minimum qualification of H.N.C., or Graduate status for medium/heavy industrial rotating plant and associated control gear. Also one assistant. Interesting work with good prospects. Applications stating age, qualifications and experience to—Contracts Manager, Harland Engineering Co. Ltd., Drives Division, 47/48, Berners Street, London, W.1. 2548

ESTIMATING draughtsman required for industrial and commercial electrical contracts. The appointment would be in North Midlands and offers scope in expanding organisation. Details in confidence, to—Box 8347.

ESTIMATOR required N.W. London. Experience in metal work and electrical engineering essential. Salary according to experience. Good prospects.—Box 2505.

EXPERIENCED contracts engineers required for progressive engineering works in the Midlands. Apply giving particulars of experience, age, salary expected, to—Box 206, c/o Dawsons, 129, Cannon Street, London, E.C.4. 2549

POLYPHASE test. Experienced testers or improvers. These vacancies afford unique opportunity for experience on calibration of a wide range of integrating electricity meters and ancillary equipment. Staff status after qualifying period. Please enquire—Personnel Manager, Landis & Gyr Ltd., Victoria Road, North Acton, London, W.3 (ACORN 531). 2522

MANAGING director small busy contractors engaged industrial installation and repair work requires assistant with supervising, estimating, invoicing experience. Later financial interest possible. Details to—Box 8345.

REQUIRED for South of Scotland area, electrical engineer to supervise cable laying and installation contracts. Good salary and prospects for the right man. Superannuation scheme and car provided. Please write stating age, experience and salary required.—Box 2406.

SENIOR draughtsman, H.N.C. or equivalent, required for electrical and mechanical design. Above A.E.S.D. rates. Full details to—Manager, Electric Vehicle Division, Harborough Construction Co., Market Harborough, Leics. 2412

SENIOR laboratory assistant (age 25-40) to be responsible for photometric and thermometric work on lighting fittings and associated problems. Work includes interesting development of techniques and apparatus allied to design of lighting fittings. Knowledge of glass, plastics, electrical circuitry and fundamental problems of vision in artificial light would be helpful. Some personal contact with clients, technical associations and manufacturers will be necessary. Company pension scheme. Salary according to ability and experience (Dip. Member of I.E.S. would be an advantage). Apply fully, marking envelope "Confidential," to Mr. J. G. Holmes, Technical Director, Holophane Ltd., Scientific Illuminating Engineers, Elverton Street, Westminster, London, S.W.1. 2516

STOREKEEPER required for electrical wholesale salers (E.W.F.), North London area. Applicant must be fully conversant with trade.—Phone STA 3395, Mr. H. Grout. 2472

STORES: Assistant manager previous experience with electrical wholesalers. Progressive permanent well-paid appointment for right applicant.—Halsey's Electric, Brandon House, Wyfold Road, London, S.W.6 (FULham 3355). 2471

SUPERVISING electrical engineer having good contracting experience, able to prepare estimates and carry contracts through to final account. Ample opportunity and pensionable position. Write fully—W. J. Furse & Co. Ltd., 22, Alie Street, Aldgate, London, E.1. 2517

TECHNICAL sales representative required by a large, well-known manufacturing company, for London and Southern England. Applications are invited from men with technical sales experience capable of negotiating contracts with engineers at high level, particularly in the electrical engineering field. Training will be provided and remuneration is by salary, expenses and commission. Apply to Personnel Manager, The Pyrene Company Limited, Great West Road, Brentford, Middlesex. 2486

TECHNICIAN/toolmaker required for interesting development work. Please apply to Bader Machinery Co. Ltd., Hersham Factory Estate, Walton-on-Thames, Surrey (Telephone: Walton-on-Thames 26377, 5 lines). 2550

THE BRITISH ALUMINIUM Company Limited, Falkirk Rolling Mills: A vacancy exists in the electrical engineering department for a young, qualified electrical engineer who is interested in the installation and maintenance of modern rolling mill and ancillary equipment. Prospects good for the right man. Applicants should have had at least 3 years' practical training in workshops and drawing office with a large electrical manufacturer. Age 25 to 35. University degree or equivalent qualification preferred. Applications to Manager. 2518

TO deal with an increasing volume of business we require additional sales engineers experienced in handling either home or overseas enquiries for H.V. and M.V. switchgear, transformers and contactor equipment. There is wide scope and opportunity for the right man who must have the essential qualities of drive and initiative, and technical qualifications up to at least H.N.C. level. Apart from opportunity, the working conditions are pleasant and congenial in a modern switchgear manufacturing organisation. Write in the first instance to—The Chief Sales Engineer, South Wales Switchgear Ltd., Blackwood, Monmouthshire. 2474

TWO electrical engineers required in the sales department of an electrical manufacturing co. situated in the Great West Road, Brentford, Middlesex. Applicants should have had a good engineering training and be able to deal with enquiries, quotations, correspondence, etc., relating to mining and/or industrial electrical gear and associated equipment. Pension and bonus schemes in operation. Write fully stating salary required to—Box 2352.

WINDING shop foreman required for the London works of an old-established and expanding electrical repair organisation. Experienced in repairing and rewinding medium and large A.C. and D.C. machines. All applications treated in confidence.—Box 2409.

WIREMAN required for medium and large-size control panels. Average earnings on piecework after probationary period 6s. 3d. to 6s. 9d. per hour. Apply personally or in writing to the Works Employment Officer, Fuller Electric Ltd., Fulbourn Road, Walthamstow, London, E.17. 2506

#### APPOINTMENTS FILLED

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.

#### SITUATIONS WANTED

ELECTRICAL engineer (35), Grad. I.E.E., seeks position in Brazil. Experience public utilities, consultants. Good Portuguese—Box 8346.

ENGINEER, supervising, estimating, 30 yrs., extensive experience contracting. Own car—Box 8339.

GRAD.I.E.E., seeks responsible but unusual technical post, Canterbury or Wimbledon orbits, £1,400 a year.—Box 8348.

SALES manager, A.Inst.M.S.M., industrial electrical equipment, 15 years' experience in control of technical sales engineers and publicity, seeks position with opportunity for further advancement in progressive organisation.—Box 8342.

SWITCH and contactor gear representative requires change.—Box 8332.

#### SALES BY AUCTION



By Order of the Secretary of State for Air

#### AUCTION SALE

for No. 14 M.U., R.A.F., CARLISLE  
(No. 5 Site, entrance via Etterby Street, Carlisle)

THURSDAY, 26th OCTOBER, 1961  
at 10.30 a.m.  
(Sale in County Hall, Carlisle)

#### 320 LOTS OF SURPLUS PLANT AND STORES

including Trailer Fire Pumps; Water Purification and Oxygen Equipment; Blower Motors and Ducts; Conveyor Equipment; Accumulators; Receivers; Amplifiers; Test Sets; Power Units; Generators; Transformers; Rectifiers; Electronic Valves; Compasses; Binoculars; Clocks; Watches; Telescopes; Magnifying Glasses; Stroboscopes; Sextants; Gyro Units; Oil Heaters; Parachutes; Office Furniture; Aerial Equipment; Ferro Silicon; Paints; Chemicals; Rack Assemblies; Teleprinter Paper; Perspex Tubes, etc.

VIEWING No. 5 Site, entrance via Etterby Street, Carlisle, from Tuesday to Thursday, 24th to 26th October. See catalogue for times, 1s. each, admits two to viewing but one only to sale, from the

Auctioneers:

**HARRISON & HETHERINGTON LTD.**  
Botchergate, Carlisle  
Phone 26292/3

2479

#### ARTICLES FOR SALE

##### HOUSE SERVICE METERS

200-240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

**UNIVERSAL ELECTRICAL CO.**  
221, City Road, London, E.C.1. 37

A.A. ELECTRICAL Co. for A.C.-D.C. motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105, 67, Rothschild Rd, London W.4. 57

A.C. and D.C. slotmeters and quarteries.

A reconditioned, guaranteed 2 years. Repairs and recalibrations.—Victor Electric Co., South View, Sweet Hill, Patcham, Brighton, Sussex. 8336

A.C. and D.C. motors, generators, from stock.—Service Electric Co. Ltd., Honeypot Lane, Stanmore, Middx. (Edgware 5566/9). 91

ALTERNATORS, 3-phase, all sizes in stock

A from 7 kVA up to 600 kVA.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (CLERKENWELL 5512). 24

ALTERNATORS and generators, all types up to 150 kW.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 151

BARGAINS in electric motors from A. Cooksley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

CABLE, armoured, P.I.L.C., P.V.C., R.I.L.C., V.C.I.L.C. All sizes in stock at our London works. Cutting and delivery same day as order received. Priced stock lists.—Batt Electrical Co., 6, Dock St., London, E.1 (Tel. Royal 5905). 316

CIRCUIT-breakers, various sizes in stock, A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

CONVERTERS, motor-alternators, motor-generators, frequency changers, etc. All types up to 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

CRANE motors. Direct current, series wound or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

DISELS generating sets, all sizes to 500 kW.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

ELECTRIC motors, dynamos, alternators and motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (CLERKENWELL 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

FLAMEPROOF squirrel cage motors. Two F 30 h.p., 400/440/3/50 at 2,900 r.p.m.

Also two 37.5 h.p. at 1,480 r.p.m. Flameproof star-delta starters also available. Overhauled. Guaranteed.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

FLUORESCENT tubes reconditioned and guaranteed with a life as new from 7s. 6d. each. Free collection and delivery in Lancs and Yorks. Save 40% on your tube replacement costs by using this service. We are also manufacturers of top quality fluorescent fittings, trunking systems, control gear and new fluorescent tubes. Generous discounts available.—Anglo-American Electrical Company, Clive Street, Bury (Telephone, Bolton 2725). 212

FOR sale, Ellison circuit breaker, 800 amps, 660 volts, complete with stand. Also several Siemens-Schuckert A.C. variable speed commutator motors.—Ballito Hosiery Mills Ltd., St. Albans, Herts. 8343

FOR sale, good unused and used machinery including electric motors, A.C. and D.C. dynamos, alternators, transformers, diesel and steam electric generating sets, mains failure sets, motor generator and Ward Leonard sets, switchgear, compressors, fans, capacitors, etc.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts (Tel. B.S. 1000/1/2). 161

GEARED motorised units. If the call is urgent within the fractional range, phone CLE. 4141.—Jeary Electrical, 132, East Road, London, N.1. 127

GENERATING sets, portable or stationary, new and reconditioned, 1 to 100 kW, A.C. and D.C.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 148

INSULATING varnish, clear, Minerva No. 720, £10 per 40-gal. drum.—Lowton Metals Ltd., Sandy Lane, Lowton St. Mary's, Leigh, Lancs. (Tel. 71441/2). 93

KARDEX, Roneodek and Shannovue cabinet nets, as new.—F. H. Jolly & Co. Ltd., 289, King St., London, W.6 (RIV. 5381). 202

LARGE stocks of new and reconditioned electric motors and starters for sale. Enquiries invited.—Massey & Coggins Ltd., Bridge Road, Liverpool, 7. 2507

MOTOR generator sets and converters, all sizes and voltages from  $\frac{1}{2}$  kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. CLERKENWELL 5512, 5513 & 5514). 12

MOTORS and control gear, huge stocks all types,  $\frac{1}{4}$  to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (5444/7). 70

NAMEPLATES, engraving, diesinking, stencils.—Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

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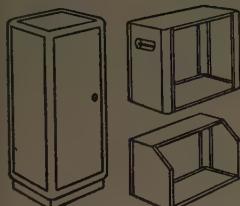
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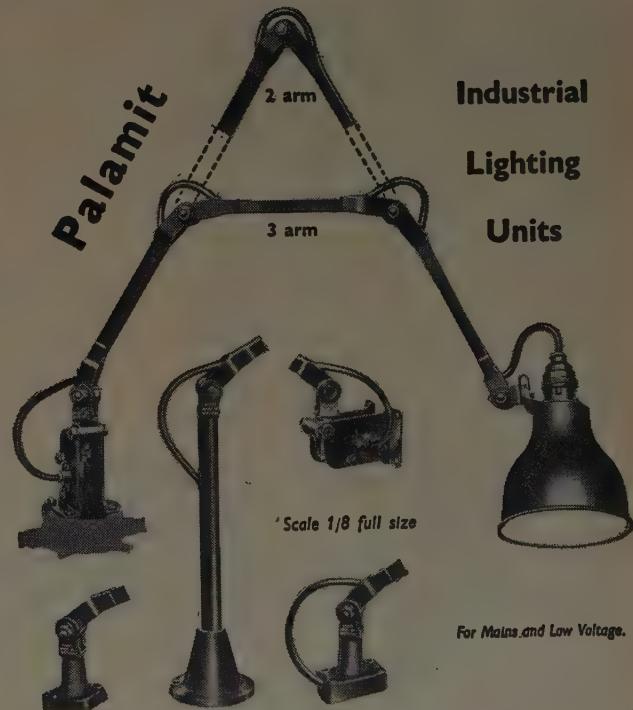


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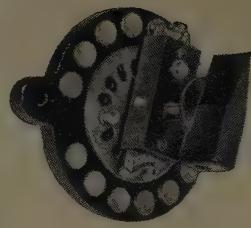


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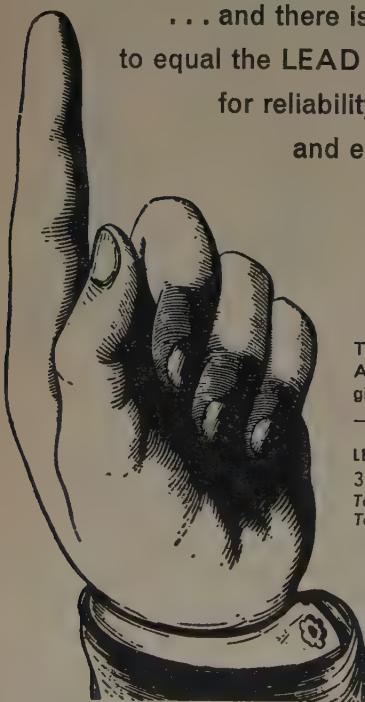


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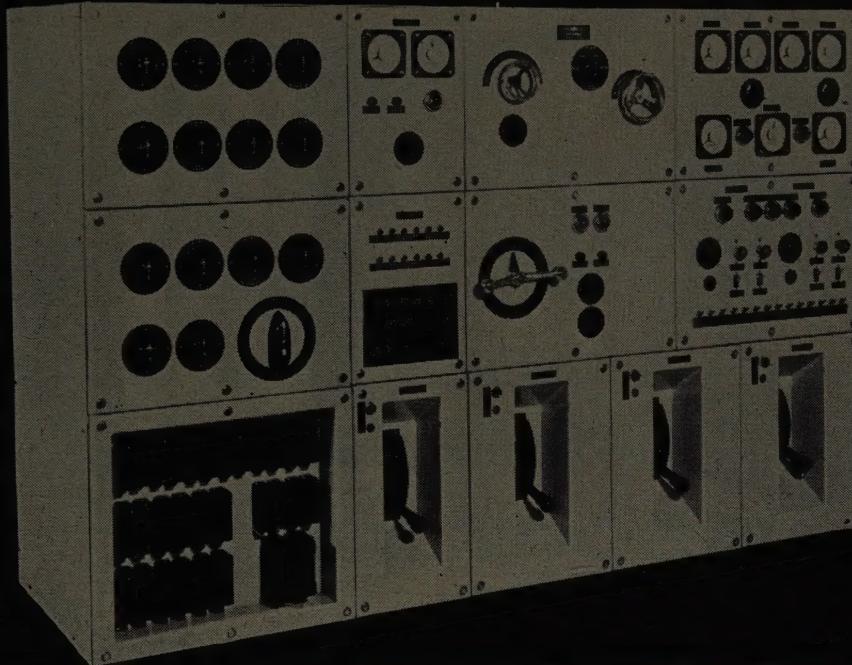
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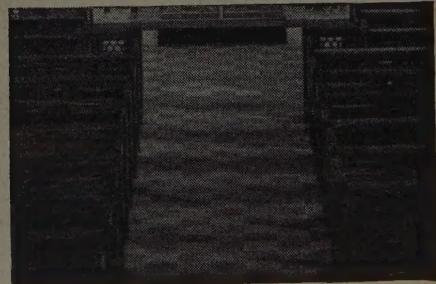
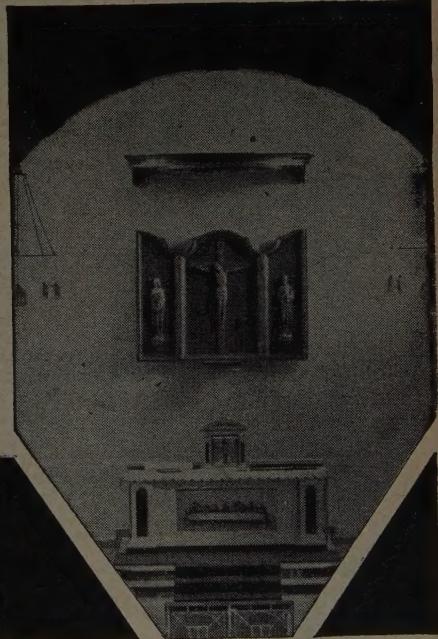
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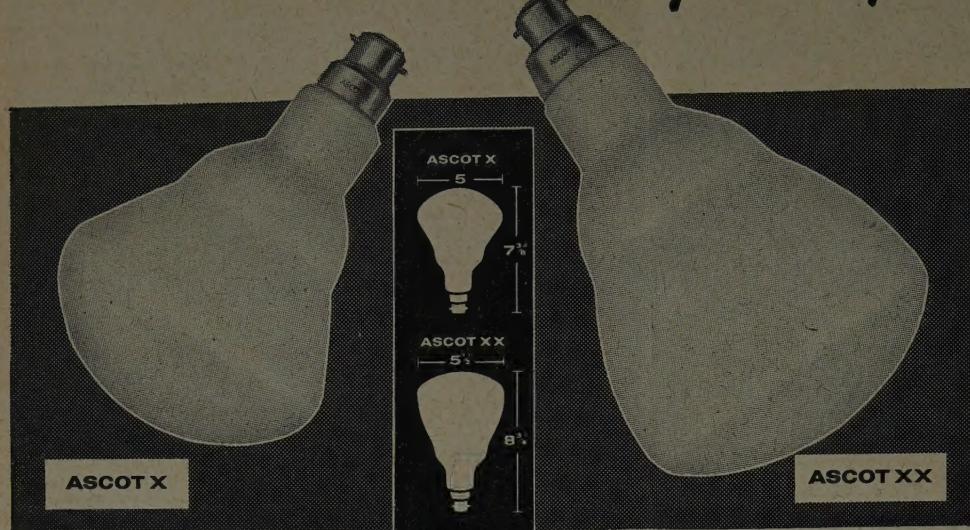
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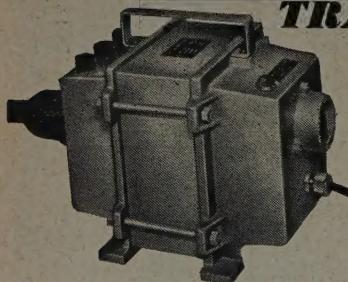
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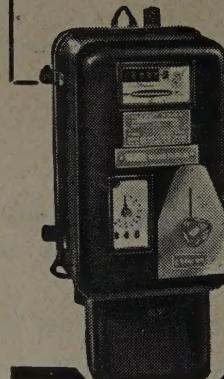
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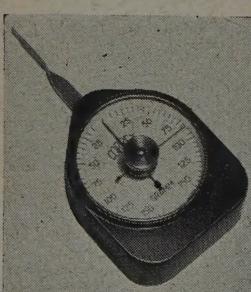
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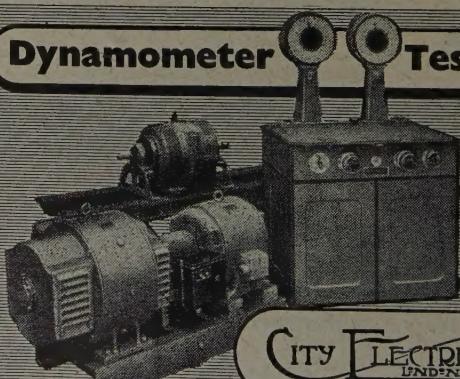
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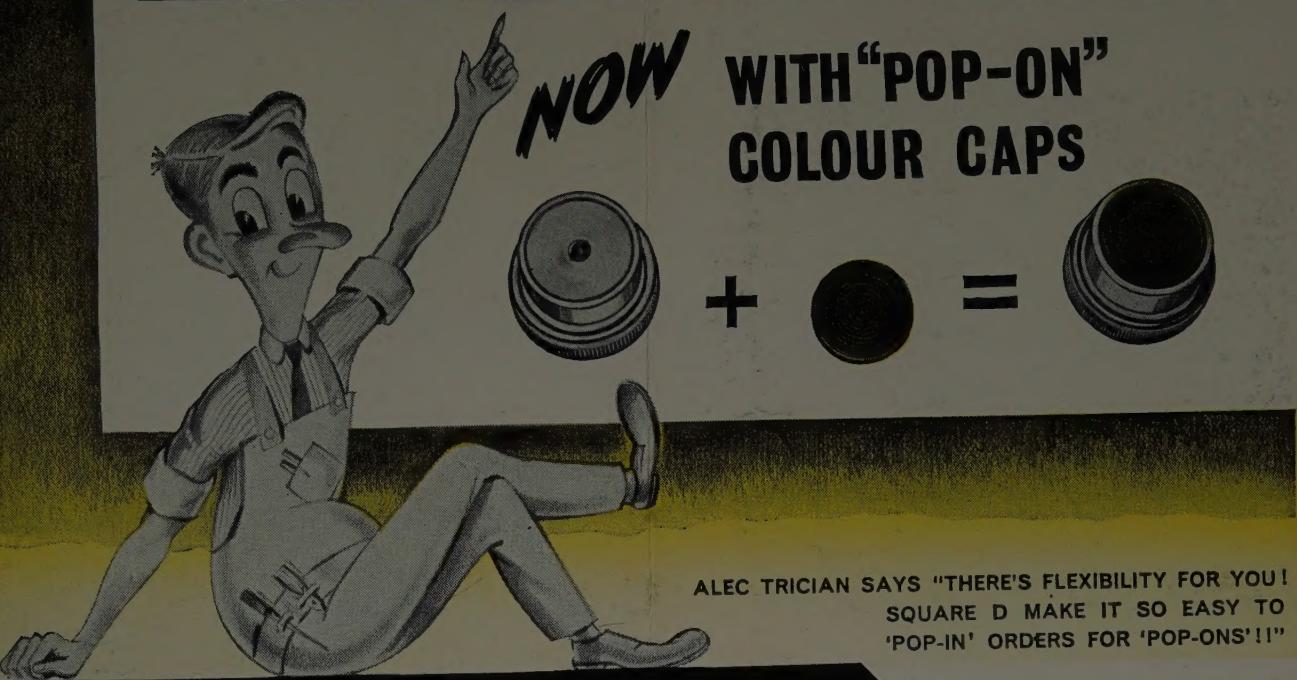
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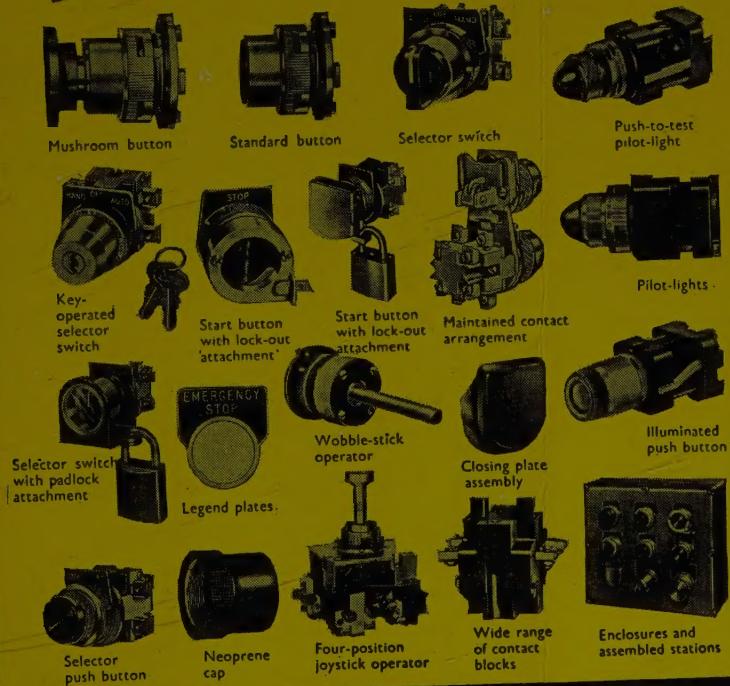
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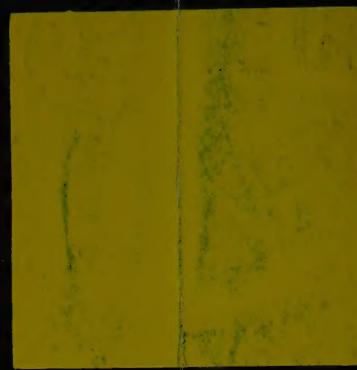
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